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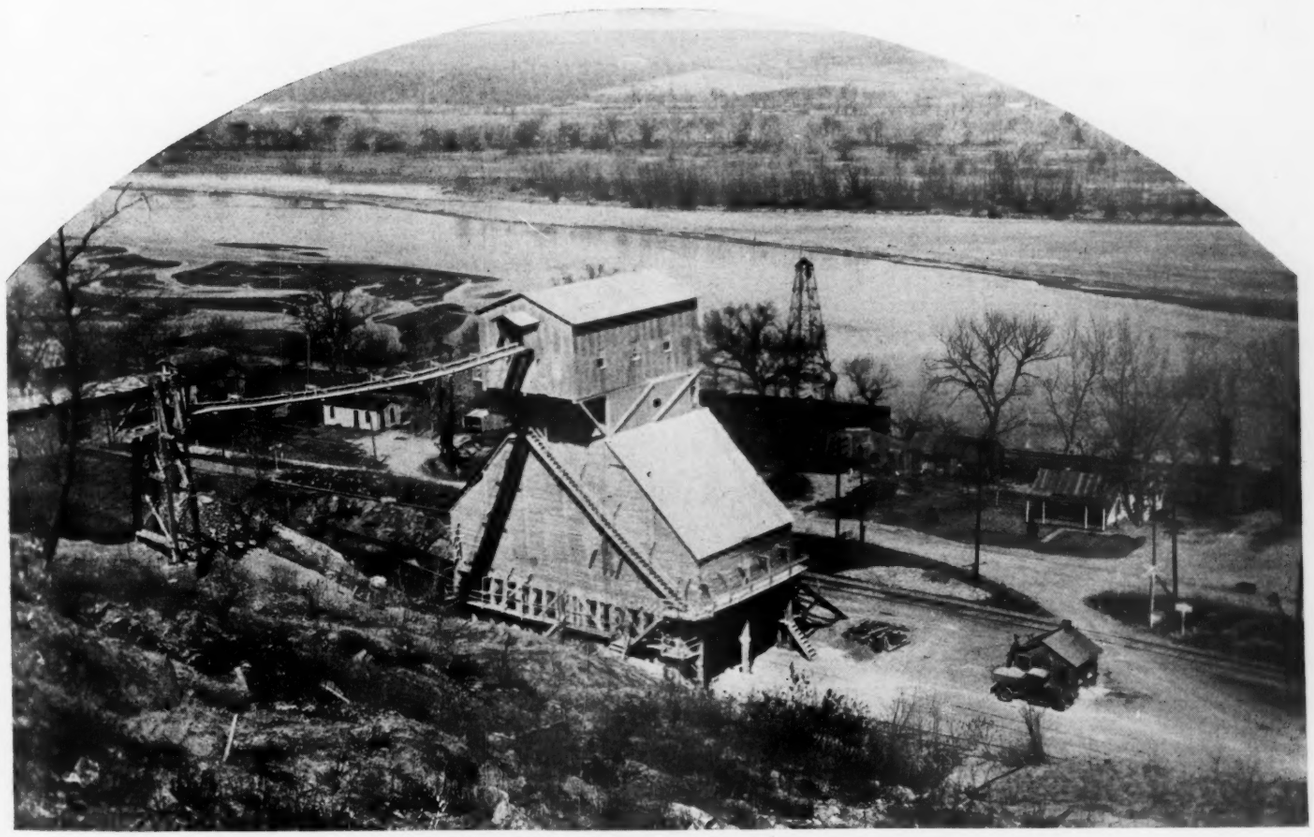
A Difficult Quarry Operation

Quarrying at Zenith Limestone Co., Tulsa, Okla., Requires Special Attention Because of Clay Pockets and Seams



General view of screening plant looking down from quarry level

ALTHOUGH FAVORED with an abundance of sand, which is removed from the bed of the Arkansas river by about a dozen small dredging operations, the Tulsa, Okla., district has no gravel deposits of importance and such stone deposits as do occur near the city are difficult to work because of the amount of overburden and the presence of clay pockets and seams.

Of such quarrying operations the nearest to the city is that of the Zenith Limestone Co. at Price, five miles west of Tulsa, on a bluff overlooking the Arkansas river. It is connected with the city by a concrete highway over which about one-half of the output is handled in trucks. Rail shipments are made over the St. Louis and San Francisco railroad, which runs past the plant.

The plant is not a new one, but a number of changes have been made in the operating methods since 1927 when control of the company was taken over by E. J. Krause, president of the Columbia Quarry Co., St. Louis, Mo.

Formerly heavy railroad type steam shovels and heavy steam locomotives were used in the quarry in connection with standard gage flat cars. These were unloaded at the crusher by means of a plow pulled along over the top of them as in railway ballasting practice.

This was discontinued and an electric shovel installed in connection with side dump

Two views of the stripping operation; a gasoline-air shovel is used

quarry cars and gasoline locomotives. The previous quarrying was rather haphazard and scattered instead of being on a continuous face and the overburden was cast back and handled several times.

This has all been changed and put on a more efficient basis, but the operation is still a difficult one because of the clay pockets and seams.

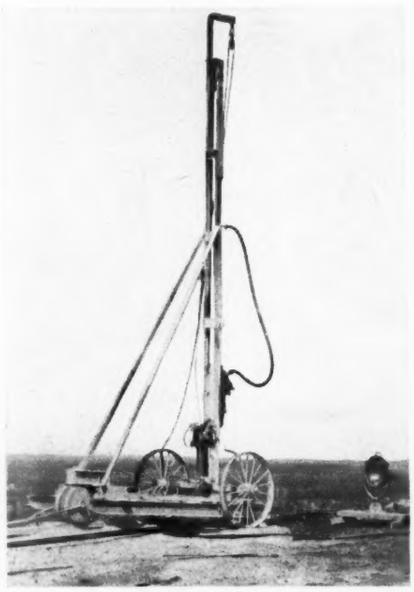
The overburden consists of about 10 to 12 ft. of heavy clay, which is removed by means of a 1¼-yd. Erie GA2 gasoline-air crawler type shovel or a Model 29 Osgood wheel type steam shovel loading to light trucks, which carry the stripping to a dump.

In places the top surface of the stone is uneven, with clay pockets sometimes several feet deep. These are cleaned out by hand and the material loaded to trucks by the stripping shovel. Some sort of a mechanical digger that could operate and dig in small spaces could be used to good advantage on this work.

Vertical clay seams in the quarry face also help to make the quarrying and loading troublesome, part of the stone being hand picked into skips or pans. These are loaded to the cars by the shovel and the refuse is dumped outside of the track in the same way. In this manner clean material is obtained. It is anticipated that at some later date this clay refuse in connection with the stone deposit will provide excellent raw material for a cement plant.

Quarrying

The limestone deposit is about 32 ft. thick, lying on top of a shale deposit, and is worked in one ledge.



Wagon mounted air drill used in quarry

An Ingersoll-Rand X70 wagon-mounted air drill is used for drilling the face, using hollow steel of four lengths up to 32 ft. and drilling an average of about 20 ft. of hole per hour. The holes are spaced 6 ft. back from the face and 4 ft. apart and a ratio of 3½ tons of rock per lb. of explosive is obtained. Compressed air is furnished by a 12x7½x10-in. two-stage Sullivan compressor belt driven by a 50-hp. General Electric motor. While this is a greater depth than is usually drilled in this way, the method has worked out very satisfactorily. It was necessary to weld the drill steel for the longer lengths.

A 2-yd. 50-B Bucyrus caterpillar type electric shovel is used to load the rock to trains of five 6-yd. side dump Western type cars each carrying an average of 7 tons of rock, or 35 tons per train. Two trains are used, each hauled by an 8-ton Plymouth gasoline locomotive running on standard gage tracks.

Crushing and Screening

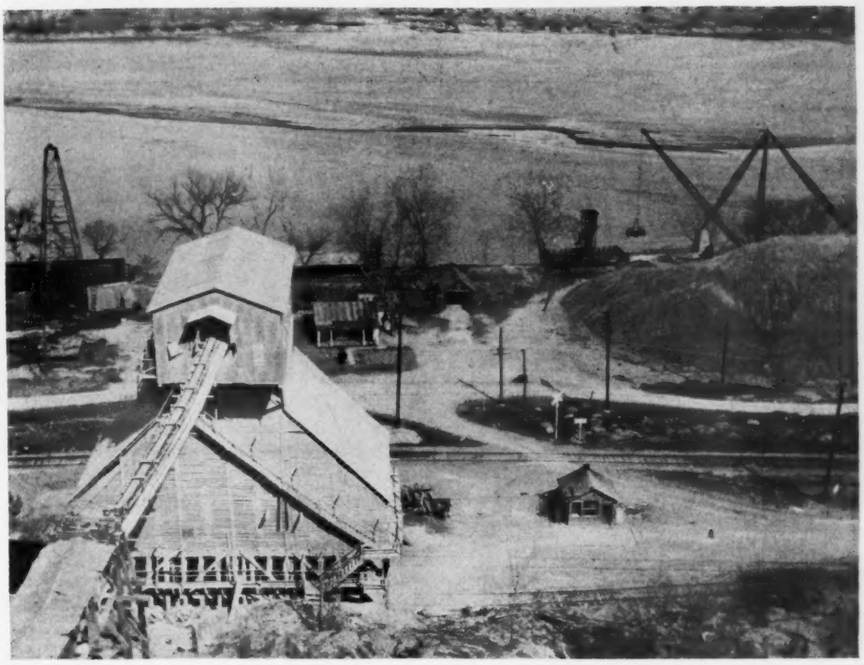
The quarry cars are dumped on a long slope to a No. 30 Kennedy-Van Saun gearless gyratory crusher which is belt driven by a 150-hp. vertical Ideal motor.

From this primary crusher the rock passes by gravity over a perforated plate screen in a chute and to a 4-ft. Symons cone

Two views of electric shovel loading in quarry; some of the waste material is shown in right-hand picture

crusher. The fine material through the screen joins that discharged from the Symons crusher in a hopper below and is then carried over to the screen house on an 18-in. horizontal belt conveyor. This conveyor is supported on a steel cable suspension bridge which connects the crusher house on the side of the slope with the screen house and loading bins opposite. A 6-in. Kennedy secondary crusher is available for additional recrushing but is not being used at present.

At the screen house the conveyor discharges to two parallel 48-in. by 24-ft. Kennedy revolving screens, each driven by a 25-hp. Ideal motor through enclosed gear reducers.



Another view of screening plant from dumping level at primary crusher

William Powell, superintendent

The screens are arranged with 8 ft. of ⅞-in. perforations, 8 ft. of 1¼-in. perforations and 8 ft. of 2¼-in. perforations with a ⅜-in. wire dust jacket. A hopper extending under both screens is provided with gates so that the ¾-in., 1-in. or 2-in. sizes may be spouted direct to their respective bins or mixed on a short belt conveyor and spouted to another bin.

Two Universal vibrating screens are used below the revolving screens to clean the smaller sizes before they go to the bins.

The bins are of the open crib type, built of planks laid flat with openings between and have a total storage capacity of about 1000 tons, or approximately a day's run. Below the bins, which extend over two railway tracks, a Universal vibrating screen is suspended from a frame and track so that it may be easily moved from one loading gate to another. This is used to further clean the stone as it is being loaded for shipment.

General

By using care in the cleaning of the ledge and in the quarry loading and by using the vibrating screens to remove the fines during sizing and loading a product is turned out which meets specifications in spite of the handicap of seams and pockets.

Because of the sticky nature of the clay when wet, washing would probably not be any more effective unless considerable washing equipment and a large amount of water were used.

The plant is operated on purchased electric power which is transformed down to 3 phase 60 cycle 440 volts.

Personnel

The offices of the company are in the Tuloma building, Tulsa, Oka. E. J. Krause is president and C. H. Krause, vice-president, both of St. Louis, Mo.; J. B. La Barge is general manager, and William Powell is superintendent.

View looking toward the city from top of screening plant

County Cuts Road Expenditures

ROCK AND GRAVEL road construction in Gibson county, Ind., probably will be suspended for a year. It was foreseen recently as commissioners rejected bids on two roads. Taxpayers have objected strenuously to the heavy tax burden caused by road building, and as a result commissioners have cut $30,000 from the present budget.—*Indianapolis* (Ind.) *News.*

New Canadian Gypsum Products Plant

Western Gypsum Products, Ltd., Winnipeg, Manitoba, an Example of the Latest in Gypsum Wallboard and Products Manufacture

By H. D. McLaughlin
President, Western Gypsum Products, Ltd., Winnipeg, Man., Can.

OUR plant is situated on 23 acres of ground just inside the western limits of the City of Winnipeg. It is a metal-clad building protected by an automatic sprinkler system, the dimensions of the plaster mill being 57 ft. x 224 ft. x 40 ft. high, and the wallboard building adjoining 57 ft. x 464 ft. x 20 ft. high.

In addition there are the specialty plant, 40 ft. x 40 ft.; tile plant, 32 ft. x 60 ft.; a brick boiler house and machine shop, 40 ft., and the office and laboratory.

The Canadian National Ry. tracks run on the east side of the buildings, and the Canadian Pacific Ry. on the west side. The plant is so designed that the loading of wallboard, plaster, etc., is centralized, thus insuring a minimum of trucking. The plaster mill is a two-kettle mill and the wallboard plant has a capacity of 80,000 sq. ft. per day, but provision has been made in both places for future expansion when conditions warrant.

Gypsum Calcining and Handling

The gypsum is high grade and arrives at the mill in one-man size loaded in 50-ton hopper-bottom cars. These cars are spotted over a concrete hopper from which runs a 24-in. steel apron conveyor on a 30-deg. slope. This conveyor discharges into a 24-in. x 34-in. Ehrsam jaw crusher, which breaks it down to 2 in. and under. A continuous bucket elevator delivers the crushed rock to a 20-in. belt running over a Stearns magnetic separator, which discharges into a bin. An automatic shaking feeder delivers the rock to an A 10 Ruggles-Cole dryer, which is coke fired. The rock as mined requires but very little drying, the temperature being kept below 160 deg. F.

From the dryer the rock is elevated directly into a Pennsylvania "Trojan" hammer mill with cage-bar spacings of ⅛ in. This mill is driven by a direct-connected 75-hp. slip-ring motor running at a speed of 1800 r.p.m. The product from the hammer mill is then elevated to a 10-ft. Raymond mechanical separator, which is set to take out all the 80- and 100-mesh material. The tailings are spouted to an Ehrsam 36-in. vertical buhr mill, grinding 83% through 100-mesh. The same elevator takes both the buhr mill product and the fines from the separator to a 100-ton land plaster bin situated above the two Ehrsam calcining kettles. Screw conveyors below this bin are so designed as to feed the kettle charge in about 25 minutes. Twelve tons constitute a standard charge and first settle stucco is made at a temperature of about 330 deg. F.

The kettles are coal fired by hand and the calcining time is under two hours. Foxboro recording thermometers are provided as a check on the calciner. The kettles are provided with a double discharge gate on the outside, which minimizes the danger of leakage at this point. The stucco is discharged into two concrete hot pits, which are equipped with screw conveyor feeders, enabling the material to be withdrawn at any desired speed. At this point the stucco is taken direct to the wallboard and tile plants, the balance being elevated to a bin over a 5-ft. x 22-ft. tubemill, driven by a 130-hp. slip-ring motor and a 12-strand Texrope. Special products are reground in a buhr mill.

The reground stucco is elevated to three 100-ton storage bins, from which it is drawn when required and elevated to the mixer bin. Screw conveyors feed it from this bin into a scale hopper over an Ehrsam mixer. The packing is done in multi-wall bags by a Bates packer.

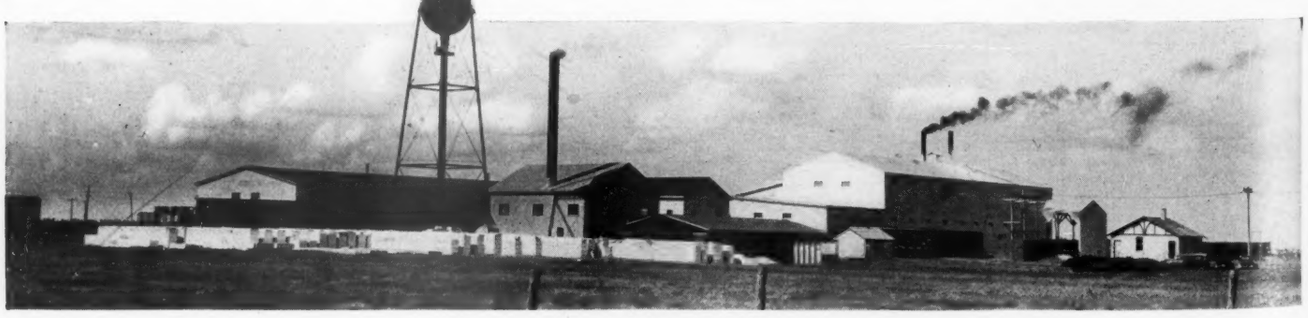
The elevating and conveying machinery, consisting of helicoid screw conveyors, 6x10-in. malleable-iron buckets and 102-B chain, was supplied by the Jeffrey Manufacturing Co. Elevator casings, kettle shells, apron conveyor and sprockets were made locally. The sprocket bearings and hangers were made by Dodge Manufacturing Co. Steel sprocket pulleys are used throughout. The main board belt was supplied by the Goodyear Rubber Co., transmission belting by the Dominion Rubber Co., the soak belt by the Gutta Percha Rubber Co. The mill is equipped mainly with Westinghouse ball-bearing motors. A few individual machines were supplied by the Canada General Electric Company. Power is supplied by the Winnipeg City Hydro-Electric Co., delivered to the mill at 4400 volts, transformed to 2200 volts for the tubemill motor. The balance of the motors are 3-phase, 60-cycle, 550-volt. A Schutz-O'Neill, Ltd., mill is used for fine grinding of some special products.

Wallboard Mill

The main portion of the wallboard machinery was supplied by the J. B. Ehrsam Co., and the automatic dryer by the Coe Manufacturing Co. Special machines used in the preparation of the wet mix were secured from the United States Gypsum Co., under whose patents we operate.

The stucco for the wallboard is specially calcined in order to impart the qualities most desirable for making a high class product.

The stucco is elevated from the kettle hot pit to a 50-ton bin in the board plant. A 6-in. drag chain controlled by a Reeves variable transmission feeds the required amount of stucco into a spout leading



New plant of Western Gypsum Products, Ltd., Winnipeg, Man.

Wallboard dryer at plant of Western Gypsum Products Co.

to the mixing conveyors. Other ingredients are also fed into this spout, and the whole is thoroughly dry mixed before being deposited on the soak belt.

The soak belt, 48 in. wide, runs at right angles to the main belt, with the discharge end centered on the forming table about 6 ft. in front of the squeeze rolls. The belt is cupped to hold a 16-ft. pond of water, through which the dry mixture passes after being corrugated by the rolls near the tail pulley of the belt. The soak belt is about 40 ft. long and discharges into a special mixer, set directly over the forming table.

This mixer thoroughly incorporates all the ingredients and delivers a perfectly mixed slurry in front of the squeeze rolls. The soak belt is controlled by a variable-speed transmission which enables the operator to keep the water ratio constant. The table section and forming rolls of the main belt are all of rigid steel and cast-iron construction.

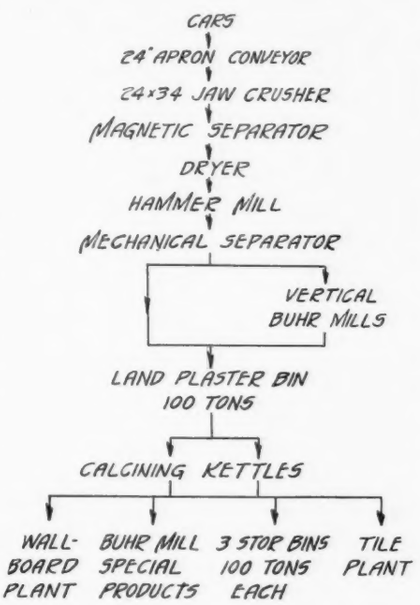
The paper used for the formation of the board is made to our specifications and is wound in rolls of about 1½ tons each, and handled on a monorail hoist. The rolls of paper are mounted on spindles, the bottom cream faced paper feeding horizontally through tension rolls and under scoring wheels, passing under the discharge spouts of the mixer and on to the squeezer rolls. The top paper is mounted above the mixer and is fed by guides down to the top squeeze roll where it is trimmed to size.

Making Special Wallboard

For our type of turned edge the folders are placed in front of the squeeze rolls, and the paste for sealing is placed on the top paper as it passes over the squeeze roll. In passing through the rolls, the edges of the board are filled and the whole shaped to the required dimensions. From this point the board is carried by the main belt until the plaster is completely set. In our case the 51-in. main belt is about 300 ft. long. Just before the initial set takes place the edges are squared up and the surface smoothed by a suitable device.

The main belt is carried on ball-bearing rollers which are kept in perfect alignment. At a point where the plaster is set a special machine attaches a label to the board with our trade mark "Stonebord."

At the end of the main belt is the Ehrsam automatic cutter, made up of two saw tooth knives operated by a solenoid controlled by mercoid switches. This machine makes a clean square cut-off of



the board in the required lengths. After being cut the board is conveyed on accelerating rolls to the transfer table which automatically places the boards in position to enter the Coe dryer. The whole operation at this end is controlled by mercoid switches.

The Coe dryer is designed for a capacity of 4000 ft. per hour, with room for expansion when necessary. It is a six-deck machine, 9 ft. wide, with overhead air circulation. The drying time is 75 minutes, which can be decreased with higher temperatures. The dryer is supplied by a 150-hp. boiler, which delivers the steam to the coils placed between each set of rollers. The air is delivered to each deck by two Sturtevant fans through specially designed nozzles, which distribute the air evenly over the surface of the boards. Most of the air is recirculated through Aero-Fin heaters, and only a small percentage discharged to atmosphere, thus enabling high temperatures to be carried without danger of damaging the product. The dryer is driven through a Reeves transmission by a 5-hp. motor. When the boards leave the dryer they are ready for shipment and are taken away by lift trucks. The boards are 4 ft. wide and all lengths up to 12 ft. Gypsum lath is also made on this machine.

Extensive Natural Deposits

The Western Gypsum Products Ltd. mine is situated at Amaranth, Manitoba, on the southwestern end of Lake Manitoba, served by the Canadian National Railway, at which point the company owns lands under which 9,000,000 tons of gypsum has been proved up without any boundaries of the deposit having yet been found. This deposit is considered practically inexhaustible. The quality of gypsum is a white rock, which analyzes almost pure. Development work was well started last season, and shows every prospect of developing into a cheap operating proposition. No water has so far been encountered and timbering will not be required.

Products—"Western" plasters include hardwall finish, cement coat, plaster of Paris, gauging and molding plaster, Keenes cement, acoustical plaster, dental and orthopedic plaster. "Stonebord" plaster wallboard, "Surebond" gypsum lath, "Westile"—precast gypsum partition, beam girder and column tile, and reinforced tile are other products made, and the erection of gypsum roofs through the construction department is another activity.

The company was formed in 1929 with a capital of $375,000 preferred and 4625 shares of common stock. Its officers are: H. D. McLaughlin, president; J. R. Spear, vice-president; H. F. R. Baker, production manager; E. J. Lythgoe, sales manager.

Researches on the Rotary Kiln in Cement Manufacture*

Part XXIV—Calculation of the Amount of Water Which Can Be Retained in the Slurry So as to Allow the Exit Gases to Escape from the Rotary Kiln at 212 Deg. F. (100 Deg. C.), on the Supposition That All External Radiation from the Kiln Shell Is Stopped by Insulation

By Geoffrey Martin

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Abstract

THE HEAT LOSSES from the rotary kiln have been described and it has been pointed out how the utilization of the low grade heat in drying the slurry makes practical the wet process of cement manufacture.

Dr. Martin, in this article, shows the method of calculating the maximum amount of water which can be retained in the slurry without increasing fuel consumption. This calculation is based on the lowest practical exit gas temperature of 212 deg. F. A table is given showing the operating characteristics under varying kiln conditions.

—The Editors.

THE REASON for choosing a temperature of 212 deg. F. for the exit gases is as follows:

The cold slurry which enters a cement rotary kiln contains much mechanically mixed water, which must be heated by the outpouring hot combustion gases from the temperature at which it enters the kiln up to the boiling point (212 deg. F. or 100 deg. C.).

The water is then for the most part evaporated at 212 deg. F., being turned into water vapor or steam. This steam is usually heated still higher than 212 deg. F. by the hot gases coming from the interior of the kiln, and so in the ordinary kiln of today escapes in a superheated condition up the chimney. But now 212 deg. F. (100 deg. C.) is a very important theoretical temperature *inasmuch as it is the lowest temperature at which water can be expelled rapidly from the slurry,* and therefore 212 deg. F. is the lowest practical temperature at which the exit gases can be *rapidly* removed from the kiln. We can imagine these exit gases being cooled and the water condensed afterwards, but *at the moment at which they escape from the kiln* these gases must possess a temperature of at least 212 deg. F., otherwise they could not rapidly carry away the moisture from the slurry. To expel the water *below* 212 deg. F. (100 deg. C.) from the slurry would either mean a long and slow drying process or else the use of a vacuum.

Hence we can assert *that 212 deg. F. (100 deg. C.) is the lowest possible practical temperature at which the exit gases can escape from a kiln, and once we have reduced the exit gases to this temperature, there lies little possibility of further substantial thermal economies being effected in the rotary kiln.*

In Part XX, a series of calculations were made as regards the temperatures at which the exit gases would emerge from a cement rotary kiln fulfilling certain conditions.

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This exit temperature was shown in Table I, Part XX, to remain steady at 212 deg. F. when the yield of clinker ranged from 9.850 to 8.680 lb. of clinker per 1 lb. of standard coal burnt, the temperature of the entering air needed for combustion of the coal being preheated from 60 to 500 deg. F. by the outcoming clinker.

In these calculations the kiln was supposed to be correctly designed—that is, all the heat was supposed to be trapped on the inside of the kiln and utilized in producing clinker, instead of passing largely unutilized down the kiln and escaping up the chimney, as it does in the ordinary practical kiln of today (which is wrongly designed).

When the yield of clinker per 1 lb. of coal burnt falls below theoretical figures given above, and in Part XX, it means that a loss of high-grade heat occurs in the upper part of the kiln, this high-grade heat being transferred by radiation and convection (by the hot gases) to the lower and colder regions of the kiln, and is there transformed into the equivalent amount of low-grade heat, without doing any useful chemical work in its passage from the high-grade to the low-grade state.

In Part XX we dealt with the weight of clinker corresponding to a flame temperature of 3769 deg. F. In order to insure continuity of treatment we will now take a series of values of clinker corresponding to a succession of lower flame temperatures, say 3700 deg. F. In Part XV it was shown that to every flame temperature there corresponded a definite weight of producible clinker, and this is the order that will be followed here.

The successive flame temperatures and the corresponding weight of clinker are set forth in Part XV, Table I, and should be consulted by the reader.

Method of Calculation of Slurry Water Described

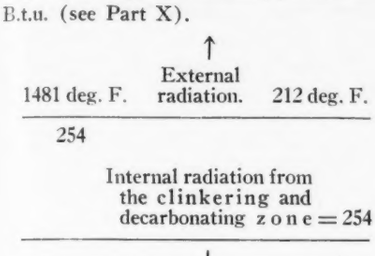
The method of calculation of the maximum amount of water which can be retained in the slurry without increasing fuel consumption so as to allow the exit gases to escape at 212 deg. F., the air not being preheated, will now be described.

In Part XV, Table I, it was shown that if 1 lb. of standard coal united with 10.478 lb. of air to form 11.278 lb. of combustion gas at a uniform flame temperature of 3700 deg. F., then this 11.278 lb. of gas, in falling from 3700 deg. to 1481 deg. F., can liberate an amount of heat which corresponds to the formation of 8.408 lb. of clinker per 1 lb. of coal burnt, or 11.893 tons of standard coal consumed per 100 tons of clinker produced.

Corresponding to this weight of clinker are the associated quantities tabulated below (see Part XVIII).

CO_2	4.404 lb.,	expelled at 1481 deg. F. (805 deg. C.)
Dry slurry	13.119 lb.	
H_2O from kaolin	0.2161 lb.,	expelled at 1472 deg. F. (800 deg. C.)
H_2O from silica	0.0908 lb.,	expelled at 752 deg. F. (400 deg. C.)

Also the number of B.t.u.'s required to heat 13.119 lb. of slurry from 60 to 1481 deg. F. is weight of clinker × 652.5 = 5486 B.t.u. (see Part X).


External radiation.
1481 deg. F.
212 deg. F.
254
Temperature of exit gases = 212 deg. F.
Internal radiation from the clinkering and decarbonating zone = 254 B.t.u.

By supposition the exit gas temperature is fixed at 212 deg. F. The mean specific heat of the furnace gases between 1481 and 212 deg. F. is 0.2610.

Also from Part XXII, Table I, we know that the sum of the internal and external radiation losses for the clinkering and decarbonating zone corresponding to data for this weight of clinker is 254 B.t.u. when the air is not preheated.

Since the external radiation loss is taken as zero, the internal radiation loss is 254 B.t.u.

Hence: Heat lost by gas passing down preheating and decarbonating zone + internal radiation into this zone from clinkering and decarbonating zone

= heat required to raise dry slurry to 1481 deg. F. + heat required to raise water contained in slurry from 60 to 212 deg. F. and transform it into steam at 212 deg. F.

Hence we get the following heat balance in the lower part of the kiln:

(1) The B.t.u.'s liberated by 11.278 lb. of combustion gas sinking from 1481 to 212 deg. F. are

$$11.278 \times 0.2610 \times (1481 - 212) = 3735.4 \text{ B.t.u.}$$

(2) Heat evolved from the 4.404 lb. of CO_2 from the slurry sinking from 1481 deg. F. (805 deg. C.) to 212 deg. F. (100 deg. C.). From our tables this equals

$$4.404\ (360.911 - 37.483) = 1424.4 \text{ B.t.u.}$$

(3) Heat liberated when 0.2161 lb. of water vapor in the kaolin at 1472 deg. F. (800 deg. C.) sinks to 212 deg. F. without condensing to liquid water. From our tables this will equal

$$0.2161\ (691.779 - 84.256) = 131.3 \text{ B.t.u.}$$

(4) The heat liberated when the 0.0908 lb. of water expelled from the hydrated silica at 752 deg. F. (400 deg. C.) sinks to 212 deg. F. without condensing to water. This heat will be (from the tables)

$$0.0908\ (336.257 - 84.256) = 22.9 \text{ B.t.u.}$$

(5) Heat radiated from clinkering and decarbonating zone into the preheating and drying zone is 254 B.t.u. The quantities of heat in (1) and (4) must equal:

(*a*) The amount of heat required to raise 13.119 lb. of dry slurry from 60 to 1481 deg. F. preparatory to its entering the decarbonating zone. This will absorb 5486 B.t.u. (see Part X), being the weight of clinker × 652.5.

(*b*) The amount of heat required to raise x lb. of water mechanically mixed with the 13.119 lb. of slurry from 60 to 212 deg. F., and turn it into vapor at 212 deg. This amounts to

$$x \times (212 - 60 + 970.7) = x \times 1122.7 \text{ B.t.u.}$$

(*c*) The amount of heat lost in external radiation in the present case is assumed to be zero.

Hence we obtain the following equation:

$$3735.4 + 1424.4 + 131.3 + 22.9 + 254 = 5486 + 1122.7x + 0 \quad \ldots\ (1)$$

or $x = 0.073$ lb. of water.

This means that under the circumstances specified, the 13.119 lb. of dry slurry may have admixed with it 0.073 lb. of water, and still the exit gases will escape at 212 deg. F.

But 13.119 lb. of dry slurry + 0.073 moisture = 13.192 wet slurry; or 13.192 lb. wet slurry may contain 0.073 lb. water; or 100 lb. wet slurry may contain 0.554 lb. of water, which can be raised to the boil from 60 deg. and expelled as steam at 212 deg.

A Modification of the Calculation

In the preceding calculation it has been assumed that the air has not been preheated by the issuing clinker. Under these circumstances, with the given clinker output, the given radiation loss would be 254 B.t.u.

If the air is preheated to different degrees and yet the clinker output per 1 lb. of standard coal burnt remains unaffected, the radiation losses must be altered. Thus the following shows the radiation losses (taken from Table I, Part XXII):

Output of clinker per 1 lb. of coal	8.408 lb.			
Temperature of preheated air	60 deg. F.	400 deg. F.	2039 deg. F.	2500 deg. F.
Corresponding internal radiation losses	254 B.t.u.	1082 B.t.u.	5414.4 B.t.u.	6733 B.t.u.

TABLE I. SHOWING THE AMOUNT OF WATER WHICH CAN BE RETAINED IN SLURRY SO AS TO ALLOW THE EXIT GASES TO ESCAPE FROM THE ROTARY KILN AT 212 DEG. F. (100 DEG. C.), ALL EXTERNAL RADIATION FROM THE KILN SHELL BEING STOPPED

Air supply 10.478 lb. per 1 lb. standard coal Clinker production			Maximum percentage slurry moisture which enables an exit temperature of 212 deg. F. to be maintained with air entering the kiln preheated to the following temperatures					Radiation Losses per 1 Lb. Standard Coal Burnt (12,600 B.t.u. per Lb.)						
								Internal Radiation from Clinkering and Decarbonating Zone into Preheating and Dehydrating Zone					External Radiation from Kiln Shell	
Tons† of standard coal per 100 tons clinker	Lb. of clinker produced per 1 lb. standard coal	Temperature of exit gases	Air at 60 deg. F. Corresponding slurry moisture	Air at 400 deg. F. Corresponding slurry moisture	Air at maximum temperature that it can be heated to by outgoing clinker* Corresponding slurry moisture	Temperature of air	Air at 2,500 deg. F. Corresponding slurry moisture	Air at 60 deg. F. Corresponding internal radiation, B.t.u. per 1 lb. standard coal	Air at 400 deg. F. Corresponding internal radiation, B.t.u. per 1 lb. standard coal	Air at maximum temperature that it can be heated to by outcoming clinker (see column 7). Corresponding internal radiation B.t.u. per 1 lb. standard coal	Temperature air	Air at 2500 deg. F. Corresponding internal radiation, B.t.u. per 1 lb. standard coal	From preheating and dehydrating zone to external air B.t.u. per 1 lb. standard coal	From clinkering and decarbonating zone and end of kiln, B.t.u. per 1 lb. standard coal
1	2	3 Deg. F.	4 Percent.	5 Percent.	6 Percent.	7 Deg. F.	8 Percent.	9	10	11	12 Deg. F.	13	14	15
6.3565	15.732	60 (cannot be kept at 212 deg. F.)	.....	.....	.....	(2500)	.....	.....	.....	.....	(2500)	.....	.....	.....
10.1526	9.850	212	.....	.....	19.32	(2352)	20.90	.....	.....	4972.0	(2352)	5,403	.....	.....
10.4384	9.580	212	.....	.....	20.52	(2293)	22.72	.....	.....	5052.0	(2293)	5,651	.....	.....
10.7400	9.311	212	.....	.....	21.78	(2236)	24.54	.....	247	5137.0	(2236)	5,898	.....	.....
11.0558	9.045	212	.....	1.43	23.05	(2178)	26.37	.....	491	5216.0	(2178)	6,142	.....	.....
11.3830	8.785	212	.....	2.43	24.32	(2121)	27.34	.....	730	5294.0	(2121)	6,381	.....	.....
11.5207	8.680	212	.....	3.36	24.88	(2102)	29.90	.....	828	5338.3	(2102)	6,479	.....	.....
11.893	8.408	212	0.55	5.83	26.24	(2039)	31.63	254	1082	5414.4	(2039)	6,733	.....	.....
12.525	7.984	212	4.52	9.62	28.43	(1944)	33.8	638	1466	5532.0	(1944)	7,117	.....	.....
13.210	7.570	212	8.52	13.45	30.58	(1853)	36.8	1018	1846	.....	.....	.....	.....	.....
13.957	7.165	212	.....	.....	33.03	(1764)	.....	1390	2218	.....	.....	.....	.....	.....
14.791	6.761	212	.....	.....	35.44	(1674)	.....	1792	2590	.....	.....	.....	.....	.....
15.726	6.359	212	.....	.....	37.95	(1584)	.....	2131	2959	.....	.....	.....	.....	.....
16.770	5.963	212	24.87	29.09	40.50	(1494)	48.75	2494	3322	6151.0	(1494)	8,973	.....	.....
17.960	5.568	212	.....	.....	.....	.....	.....	2857	.....	.....	.....	.....	.....	.....
19.301	5.181	212	.....	.....	.....	.....	.....	3213	.....	.....	.....	.....	.....	.....
20.855	4.795	212	36.96	40.63	48.38	(1226)	57.58	3567	4395	6509.0	(1226)	10,046	.....	.....
30.120	3.320	212	55.07	57.76	61.18	(881)	70.06	4922	5750	6063.0	(881)	11,401	.....	.....

*There are 10.478 lb. of air at 60 deg. F. entering the kiln per 1 lb. of standard coal burnt, while there are X lb. of clinker (shown in column 2), issuing at 2500 deg. F. This clinker will then be capable, under the most favorable conditions of heating the air to the temperatures shown in column 6. For list of temperatures corresponding to different weights of clinker, see Chapter XVII.

†Tons of 2240 lb.

If the preceding calculation be repeated and, instead of putting the internal radiation losses as = 254 B.t.u., the other figures from the table of Part XXII are substituted, we get the possible allowance of water for the cases when the air is preheated to various other temperatures.

E.g., if the entering air is preheated to 400 deg. F., the internal radiation loss is 1082 B.t.u., and we get instead of equation (1)

$$3735.4 \times 1424.4 + 131.3 + 22.9 + 1082 = 5486 + 1122.7x,$$

or $x = 0.8106$ lb. of water

So that when the air is preheated to 400 deg. F., 13.119 lb. of dry slurry may have admixed with it 0.811 lb. of water, or 13.119 + 0.811 = 13.93 lb. of wet slurry may contain 0.811 lb. of water.

Whence 100 lb. may contain $\frac{0.811}{13.93} \times 100$ = 5.83 lb. of water, which could be heated from 60 deg. F. to the boiling point, and evaporated at 212 deg. F.

Proceeding in this way for different yields of clinker per 1 lb. of coal and for various degrees of preheating of the entering air, the table on the preceding page has been calculated.

Remarks on the Table

This table is very instructive as regards showing the *increase* of fuel consumption with an increasing percentage of moisture in the slurry, and especially as regards showing the importance of preheating the *entering air* as highly as possible if it is desired to reduce the fuel consumption to the lowest possible limit.

It shows, for example, what will happen when all external radiation from a kiln is stopped.

Consider, for example, the case when the air entering the kiln is not preheated at all (*i.e.*, enters at 60 deg. F.); the results are set forth in column 4 of Table I.

If the kiln output is to be maintained at 100 tons of clinker per 11.52 tons of standard coal, the exit gases being kept at 212 deg. F. (100 deg. C.), then no water at all can be mixed with the slurry.

On adding water to the dry slurry so as to make the percentage of moisture in the wet slurry 0.554%, we find that this will increase the fuel consumption to 11.893 tons of standard coal per 100 tons of clinker (still keeping the exit gases at 212 deg. F.). An increase in the slurry moisture to 4.522, 24.87, 36.96 and 55.07% will cause the corresponding fuel consumption to increase to 12.535, 16.770, 20.855 and 30.12 tons of standard coal per 100 tons of clinker, respectively.

Now consider the case when the entering air is preheated to 400 deg. F., the exit temperature of the gases being kept steady at 212 deg. F. (100 deg. C.), This case is shown in column 5 of the table. Here no water at all can be present in the slurry if the fuel consumption is to be maintained at 10.74 tons of coal per 100 tons of clinker.

If water be added to the slurry to bring the percentage up to 1.43%, then the fuel consumption will increase to 11.0558 tons of standard coal per 100 tons of clinker. Further increase in succession of the slurry moisture to 9.62, 40.63 and 57.76% will cause the fuel consumption to increase respectively to 12.525, 20.855 and 30.120 tons of standard coal per 100 tons of clinker.

Columns 6 and 7 show the effect of arranging the kiln so that *all* the heat in the *outcoming clinker* is utilized in preheating the incoming air (the latter being kept at 10.478 lb. per 1 lb. of standard coal). Then, if we maintained the exit gases at 212 deg. F., we see that 20.52% of moisture in the slurry would cause a fuel consumption of 10.4384 tons of standard coal per 100 tons of clinker; 30.58% of moisture would increase the fuel consumption to 13.210 tons of coal per 100 tons of clinker, where 40.50% of moisture would cause the fuel consumption to increase to 16.770 lb., while 61.18% of slurry moisture would increase the fuel consumption to 30.120 tons of fuel per 100 tons of clinker.

Finally, column 8 shows the effect of heating all the incoming air to the clinkering temperature of 2500 deg. F. before letting it enter the combustion zone.

Under these circumstances a fuel consumption of 10.1526 tons of standard coal per 100 tons of clinker is possible with a slurry moisture content of 20.90, while a fuel consumption of 30.120 tons of standard coal per 100 tons of clinker would allow of a slurry moisture of 70.06%.

The most important point brought out by Table I, however, is the fact that it is *not the moisture in the slurry that is instrumental in causing the poor clinker output per lb. of coal burnt in the modern rotary kiln.*

Thus a glance at the table will show that with the entering air preheated to 400 deg. F. (which is what may be taken as normal for a modern kiln), the slurry moisture could be 40.63%, and the fuel consumption would only be 20.855 lb. of standard coal per 100 tons of clinker.

Seeing that the average modern kiln working with a slurry of this composition consumes, say, 33 tons of standard coal per 100 tons of clinker, the enormous difference between what the practical kiln consumes and what it should consume is certainly not due to the moisture content of the slurry, but must be due to other causes, such as the ineffective and bad design of the clinkering and decarbonating zones.

The efforts made in recent years to improve the fuel economy of rotary kilns by concentrating on reducing the water content of the slurry are largely due to a faulty grasp of the theoretical thermodynamical principles which govern the kiln.

The same efforts applied to improve the efficiency of the clinkering and decarbonating zones, especially as regards utilizing the heat of the outcoming clinker to preheat the entering air, could not fail to have produced much greater economies.

As shown above, the real cause of the inefficiency is the loss of high-grade heat in the upper part of the kiln (due to radiation both internal and external, and to convection by the hot gases), which escapes unabsorbed down into the lower part of the kiln and is wasted in evaporating water or in raising the temperature of the exit gases.

(*To be continued*)

Curing Concrete Pavements

ACCORDING to R. W. Crum, director, Highway Research Board, Washington, D. C., surface applications of calcium chloride in regions where the air temperature and humidity are such that the salt will readily dissolve have been found to produce concrete 90% or more as strong as concrete cured with a wet cover, with no greater changes in volume. This method has not been found to be a primary cause of surface scaling in appreciable amounts. Extensive surveys show that the percentage of total area scaled under either wet earth or calcium chloride surface curing is very small. If conditions conducive to scaling are present the scale is likely to occur under either method but will probably be somewhat more extensive on the calcium chloride cured work.

Concrete cured with bituminous coatings, in general, showed strength 90% or more of that of wet cured concrete. Volume changes as evidenced by temperature ranges, direct measurement and crack surveys are greater, indicating that more frequent shrinkage cracks are to be expected unless prevented by proper joint spacing. Bituminous cured pavements in regions where fines and subgrades are a distinctive feature have been examined which showed uncracked slab lengths as great or greater than those on pavements cured with wet earth. Coating the bituminous covered surface as soon as possible with some light colored material such as whitewash appears to decrease the volume changes.

Conflicting evidence regarding the strength of concrete cured with calcium chloride admixture, or surface application of sodium silicate makes further information necessary before definite recommendations can be made.

The volume changes occurring with the use of sodium silicate as a curing agent were not great enough to make this factor a matter of importance in deciding upon its use.

Canadian Feldspar Production

THE PRODUCTION of feldspar in Canada in 1930 totaled 26,796 tons, mostly furnished by the provinces of Quebec and Ontario. It is used in the manufacture of tableware, electric porcelain, floor and wall tile, bottle glass and scouring compounds.—*Toronto Financial Post.*

The Sand and Gravel Industry and Its Problems

Part V—Sand Settling and General Plant Economics

By John Zollinger
Oakhurst, N. J.

Abstract

IN THIS concluding number of his series of articles the author comments on a number of things of general interest to the sand and gravel producer. Among other things he points out that good engineering assistance is more economical and satisfactory in solving the problems that are continually arising than experiments or trial methods.

An interesting graphic illustration is given of the relation between the tonnage output and profits of several plants. This chart method shows more clearly than tabulated figures the results of analyses of plant operation.

—The Editors.

IT IS A PITY that commercial writing is comparatively dry and without the excitement that can be worked up in novels. I am sure nobody sits pop-eyed and spellbound while reading such articles as this, yet for all that the writing requires patience and a certain amount of practical experience, which is not necessary when we simply let imagination roam.

Perhaps a more interesting and novel way to commence an installment might be a start, something like this: "It was midnight and still the continuous tap, tap, tap, tap of feet could be heard in the Jones library. For the tenth time, and more irritable, came the voice of Mrs. Jones:—'For Pete's sake, John, will you stop your wandering and come to bed.' Silently, slowly, Mr. Jones ascended the winding stairs; but the loving call of his mate did not hasten his footsteps for his mind was still in the sand and gravel pit."

For a fact there are a good many Joneses who have walked the floor; pioneers of this industry who have plowed their way through disappointment and hardships. Some of these men, filled with accomplishments, are still going strong and their past would make inspirational reading. But we generally wait until a man is dead and gone and then heap on the relatives the glory and appreciation that might have eased the burden of the living.

But since this article is strictly devoted to sand and gravel, let us again assemble at the quartz fields and leave the ridiculous for the sublime.

Remarks in General

It might be well to remark that some statements made in this series of articles may well be criticized by producers in different localities, since no two plants will work identically.

While draglines are successfully used in some parts of the country they would prove a failure here. Within a radius of 100 mi. I know at least 12 operations and each differs materially in one way or another in its principle of operation. No doubt a more defined and simple process will be developed, one which can be more generally adopted and will simplify plant construction. In the meantime we will have to iron out our immediate difficulties and improve the methods now employed.

It has taken the progressive plant operators to perfect methods, the operators who were not satisfied with the way things worked but found a better way and still a better way. The danger lies in being satisfied with the way things are going—that applies to every branch of the business, production, maintenance and selling. It does not take very long for a firm to become stagnant when the driver relaxes.

There is a saying, "You can tell the successful farmer by his fences." You can also tell a successful sand and gravel business by the shape the machinery is in. Well-kept machinery denotes efficiency and good management; it is a fair bet that the same qualities exist in all departments.

Here is a suggestion to check up on the appearance of a plant. Take a few fair sized pictures of the layout and all rubbish, old discarded machinery, and everything you have forgotten will jump into the foreground. This very experience came to the writer about a week ago and resulted in a four day clean-up.

All these phases have their psychological effect upon the personnel; order, punctuality and efficiency, are necessary to get the best results from your men. The writer has always insisted on having the plant started punctually in the morning. Any foreseen repairs are made in the evening to make sure of an early morning start, then the men are fresh and start on their daily routine with a will, while a bad start in the morning seems to upset the equilibrium for the whole day.

The Men Who Work the Soil

As a rule the men in a sand and gravel plant are a wonderful lot. I have seen mechanics work under shovels for 14 hours at a stretch and never bawl. I have seen them lie in mud and water to take out a bearing and take satisfaction in having done a difficult job. I have seen a young fellow smoke a cigarette after having his leg crushed between the bumpers of two cars and have seen the same boy help put up a trestle and work 30 ft. in the air with a cork leg. Perhaps it is the constant contact with mother earth and God's open country that somehow seems to make them different from the men who work inside.

While I may be side-stepping a bit I feel that I should pay a tribute, if only a meager one, to the men who play such an essential part in this interesting industry.

Maintenance

A highly important link in the management of any sand and gravel operation is the machine shop or maintenance department. If the enterprise is a large one, no doubt an up-to-date machine shop will have developed as a matter of necessity. As a rule there is no lack of work to keep this part of the plant busy, and good mechanics are a blessing in an emergency.

The wide variation of jobs that come into the repair shop would require the following qualifications in a good mechanic: he must be able to handle a cutting and welding torch, understand motors (both electrical and gasoline), run a lathe, drill press, and generally understand machinery such as shovels, screens, crushers and pumps. He must know how to do accurate work and also be satisfied to dive into grease and dirt when required to do so. In other words, he must be a genius and be willing to work at a fairly low price.

If something goes wrong the mechanic is called and as a rule he has to stay nights to get things going. As long as a piece of ma-

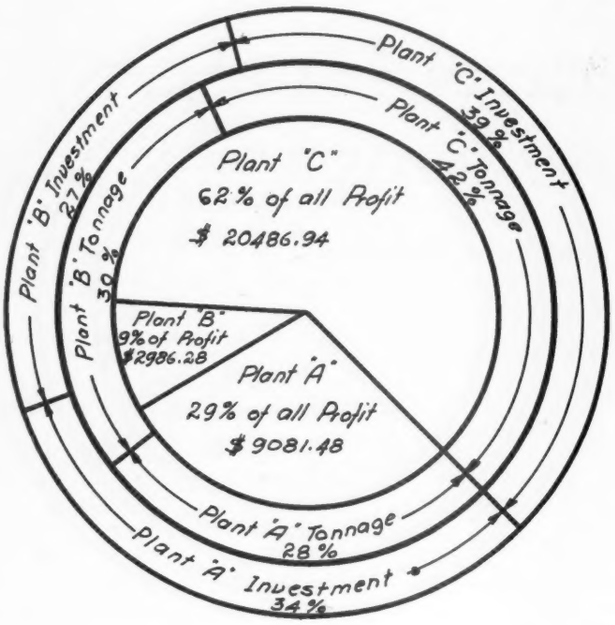

Plant 'C' Investment 39%
Plant 'C' Tonnage 42%
Plant 'B' Investment 27%
Plant 'B' Tonnage 30%
Plant 'C' 62% of all Profit $ 20486.94
Plant 'B' 9% of Profit $2986.28
Plant 'A' 29% of all Profit $ 9081.48
Plant 'A' Tonnage 28%
Plant 'A' Investment 34%

Fig. 1

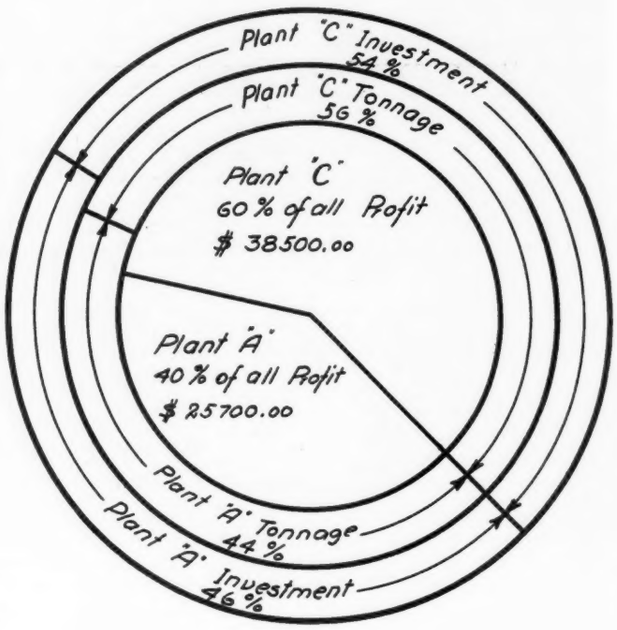

Plant 'C' Investment 54%
Plant 'C' Tonnage 56%
Plant 'C' 60% of all Profit $ 38500.00
Plant 'A' 40% of all Profit $ 25700.00
Plant 'A' Tonnage 44%
Plant 'A' Investment 46%

Fig. 2

chinery runs, all is well, and unless strict inspections discover warning signs, the piece of machinery will run until nothing is left to repair. Then like the proverbial Alladin, the mechanic is expected to wave his monkey wrench—and lo, he maketh all things new. At such times we certainly appreciate the resourcefulness of a good man and his place in any organization has an importance that should not be overlooked.

Engineering

More and more, producers have come to realize that hit and miss calculations are proving expensive experiments. An engineer with practical experience will prove the greatest asset in a business which is large enough to employ a man of this type. An engineer will work methodically, he has the trained mind which precludes guesswork. I do not mean that every engineer will make a successful sand and gravel producer, but certainly if his talents and inclinations lie in this field, he can do more without guesswork than the technically untrained.

Drawings and plans should be made for any changes or new construction. These plans may then be criticized on paper and a lot of hasty mistakes will be seen before a lot of money is spent on them. Should the enterprise be a small one, there are good consulting engineers, who know the business and their services are well worth their seeming high cost.

I am certainly glad to see that this practice is followed a good deal more extensively today than it was a few years ago, and the firms which have realized the importance of the technically trained man have profited by his knowledge.

One phase of this business has not been touched upon; that is sand washing, settling and dewatering. My past year has been spent exclusively with this problem; that is, the production of a fine, washed sand. Since it is a rather secret process and this particular class of sand is not handled by the average sand producer, suffice it to say that the operation produces a sand 50% of which passes a 50 mesh screen and has a production of 1500 tons in ten hours with a personnel of nine men, which includes the loading gang. Thirty per cent of the raw material consists of clay and has to be discarded.

I mention this for the reason that having had experience with sand, I am reluctant to dish out advice or methods that might be applied in one place but prove a failure in another.

Sand Settling

Some little time ago while turning this over in my mind I noticed a little ad in Rock Products, offering a free supply of several articles published in this magazine some time ago. I have since received a booklet on "Sand Settling" by Edmund Shaw, which covers this phase of the business in a very extensive and very thorough fashion. Drawings and cuts of machines including the most up-to-date equipment will be found and the art of settling and dewatering, and the principles governing the operations will become quite clear after reading this worthwhile booklet.

The question, of course, will still arise—what to use, which kind of machine to select and the method of storing and loading. Again I say, get a man who has had experience in this line—gratuitous advice generally comes high, and your own guess might be as good as the next man's. But to know and proceed with intelligence and assurance of success, knowledge based on past experience is necessary. There may be a certain pride in finally arriving at the conclusion that could have been bought, but whether the business can stand the unnecessary expense certainly is a question.

As a rule the production of concrete sand will present no big problem except where specifications are such that the raw material is out of proportion in one way or another, such as a shortage of minus 50 mesh material—a case that comes to my mind. Since this shortage was detrimental on state work only, two "V" type settling boxes were built. The first one settled the coarse sand or general run, and loaded direct into cars. The second box settled the fine sand and its discharge was arranged to mix with the first when opened. A small portion of the fines would be robbed from the sand used on local jobs and stored in the second box. When loading state material this was permitted to discharge and mix with the material from the first box, a sort of robbing Peter to supply Paul proposition, but it worked.

Inefficient Operations

A very interesting story is told by Figs. 1, 2 and 3. A well known concern was operating three small plants within five miles of each other. After two years the profits did not show as great as anticipated and the reason was found to be the low tonnage handled by each plant. From the available data Fig. 1 was drawn and it will be seen that plant *C* showed 62% of all profits and was easily the most profitable plant. An interesting phase is the fact that in handling 42% of the entire tonnage, this plant made a profit of $20,486.00, whereas plant *B* handling 30% of the entire tonnage only showed a profit of $2,986.00. Referring to Fig. 3 the lines have been plotted from the data

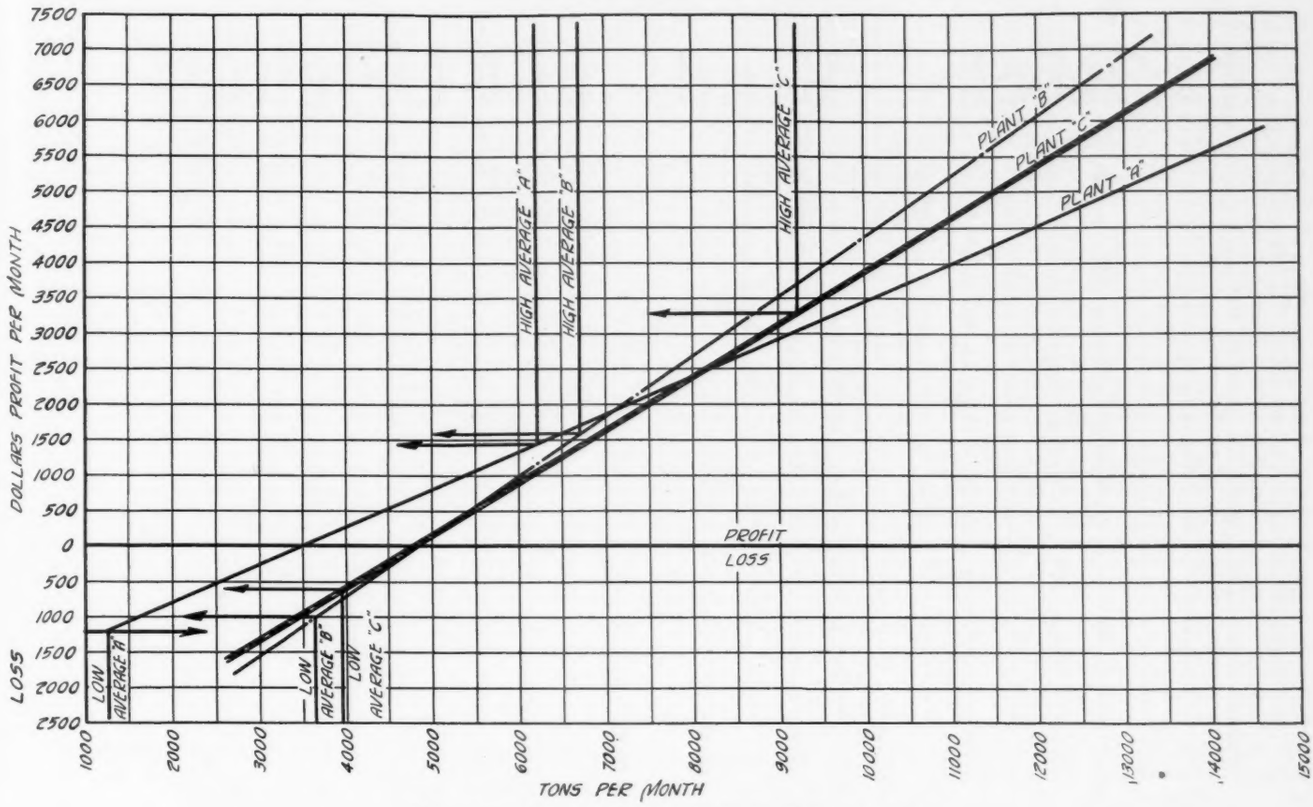


Fig. 3. Production chart relative to Figs. 1 and 2

available from one year's operation and merely indicate the profits made per month by distributing the expenses and profits evenly over a period of ten months. In other words, the lines do not show the efficiency of the plants but indicate what each plant has made per month during this specific time. The reason for the low efficiency of plant *A* is the fact that it has been permitted to operate at a very low average and never has had the tonnage to give it a high average. This, however, would not denote that the plant is inefficient but gives a clearer understanding of the fact that the tonnage has not been properly distributed among the three plants. Plant *C* has handled the bulk of the production and naturally made most of the profits.

After considering the various angles it was decided to shut-down plant *B*. After this decision had been made Fig. 2 was drawn up and the additional tonnage formerly absorbed by plant *B* turned over to plants *C* and *A*. Plant *C* under this plan then handled 56% of all the tonnage and plant *A* 44% of all the tonnage. Figuring from the chart the profit of plant *C* would then be $38,500.00 and the profit of plant *A*, $25,700.00. Comparing Fig. 1 and Fig. 2 we find that with three plants operating we have a total profit of $32,554.00. With two plants operating we have a profit of $64,200.00 or pretty nearly double. The investment of plant *B* has not been taken into consideration since this plant would become a general item.

The writer has found that charts of this type present conditions in a form easily understood by anyone and bring the facts home more clearly than figures without illustrations. It is seen at a glance that in Fig. 1, plant *B* plays an inferior part in the accumulation of profits and comparing figures alone the fact would not be brought home as forcibly as with the little slice of circle which represents plant *B*.

A further fact revealed by Fig. 3 is that running a plant at a low production *probably does more to keep profits down than any other condition.* It will be seen from Fig. 3 that plant *B* and plant *C* are losing money when operating below 4,750 tons per month and plant *A* breaks even at 3,500 tons. Ample storage provides a good equalizer but since the sales govern the production, dull seasons will necessitate shut-downs as the only other alternative. It certainly does not pay to run below the profit line.

Judgment versus Salesmanship

In these days of keen competition and low prices high efficiency is the important factor and a perfect coordination of machinery is the prime requisite to attain this. It may seem presumptuous for me to make such a statement, but I do think our industry would be infinitely better off if some of the equipment that has proven worthless were dropped and the manufacturers devoted their abilities to something that would give the buyer his money's worth.

Repeatedly I have come to plants in which a section is devoted to storage of unsuccessful machinery, a fact which may indicate good salesmanship on the part of the manufacturer but the psychological reaction is certainly to the contrary. The deplorable situation is made more pronounced since there is practically no resale value on these pieces of machinery. I am not talking of equipment which is discarded as a matter of legitimate progress, but the merchandise which has been unloaded upon inexperienced operators by unscrupulous sales methods.

A wonderful piece of work could be accomplished by the National Sand and Gravel Association, by forming a committee to approve such pieces of machinery as would give the buyer assurance of satisfaction, and for one, I certainly would like to be on that committee. This idea is not at all far fetched, and I certainly would like to hear the opinion of the readers as to its feasibility; approval by competent men would assure the buyer of a fair chance.

Conclusion

Should anyone be looking for specific information regarding certain phases of the sand and gravel industry I am sure he will find more than one answer to his problem. Looking over the May 9 issue of Rock Products we see an apparently simple question answered in nine different ways, one of which will probably be the best solution, but which does not signify that the others are without merit. The important thing to bear in mind constantly is the simplicity of a device. If a straight or vertical side will do the work of a comparatively complicated mechanism, that is the thing to use.

Rocks—Kinds and Origins*

A Readable and Not Very Technical Discussion of Things Every Quarry Operator Should Know

ROCKS may be classed according to their composition, as follows: (1) silica; (2) alumina; (3) lime; (4) silicates. The last named has silica as its principal constituent, and most alumina rocks also have silica in them, so we may reduce all rock masses down to two general classes, called calcareous and silicious rocks. The word calcareous is from the Latin, *calce* (lime), and, as you all know, the ending *ous* means composed of, so that a calcareous rock is principally composed of lime, though all such rocks contain some silicious matter.

The common calcareous rocks include chalk, *limestone,* and marble, and they are called carbonates, because of the carbonic acid they contain, which serves to distinguish them. When calcareous rocks are burned in a kiln, the acid is expelled, and leaves quicklime which is oxide of calcium. When any of the common acids are placed on calcareous stones they fizz like soda water, due to the escaping carbonic gas; even vinegar, which is a fruit acid diluted with a large percentage of water, when placed on a lime rock, will cause action, as I myself have used it when away in the African jungle, and have been out of hydrochloric (muriatic) acid, and found it useful.

Limestone in Its Various Forms and Origins

Lime rocks are nearly all soft enough to be scratched with a nail or knife, and this fact helps to identify them. Limestone is one of the most abundant rocks. Frequently limestone contains a little of the carbonate of iron, when it is known as ferruginous limestone, or it may contain clay and is then called argillaceous (containing clay) limestone, and so on. Oolite is one of the common varieties of limestone. It consists of heaps of little round concretions of carbonates of lime, about the size of the eggs in the roe of a cod-fish, hence it is sometimes called roe stone. Limestones result chiefly from the depositions on ancient ocean beds of the calcareous remains of marine organisms or of the dropping out of solution of the materials held in the waters of these oceans. The organic origin of the limestone can be clearly seen in many cases from fossil remains.

If we were to examine a piece of chalk with a good microscope, we find it composed of minute shells, which proves that chalk is simply a consolidation of animal fossils. Animals have the power of secreting lime from the water in which they live. Even when lime rock contains no visible fossils, it is possible that the sea has ground the shells and corals into a fine powder, which settles out, forming sedimentary lime rocks. When these lime sediments are brought under the influence of heat and pressure within the earth, they crystallize into calcite (calc spar) and marble, which action destroys the original shapes of fossils.

We have seen that in the cretaceous, or secondary rocks age, vast strata were formed, so that it was known as the chalk period. From the vast amount of lime rock in the world today, an idea may be formed of the animal life that must have existed ages ago.

Dolomite

Then we have magnesian limestone, which is called dolomite, and it will not fizz with ordinary acids, unless heat is applied, and these two facts make it easy to distinguish between limestone and dolomite.

Dolomite occurs abundantly, and is a constituent in many rocks. It has a variety of uses, which are increasing yearly. The magnesium it contains is used in the arts for flashlight powders, also in explosives, and the powdered oxide has a commercial value for medicines, and is used quite a lot for furnace linings when "dead burned."

Marble is crystallized limestone, and its origin is due to the solution or the fusion of limestone, which in cooling and precipitating forms into a crystalline structure.

When clear marble is broken, the fine grains or crystals show like loaf sugar, and the various colors of marble are given it by iron and other impurities. Ordinary fruit acids, like the juice of a lemon, will affect marble, while stronger acids cause it to fizz up like soda water, and it is well known that the acids of the atmosphere slowly decompose marble, so that while very pretty and pleasing to the eye, marble will not endure like granite or a good hard magnesian limestone when exposed to the atmosphere.

Silicious Stones

The word silicious means composed of silica, but do not understand that silica rocks are composed wholly of silica. As a matter of fact many silicious stones contain some calcareous matter. Quartz is an oxide of silicon, made up of oxygen, a gas, and silicon, a non-metallic element hard to separate. Quartz is so hard that it strikes fire coming in contact with steel, and will scratch glass, but as a rule cannot be scratched with a knife. It breaks into fragments which have a glassy luster. The silicious stones are the most plentiful form of rock, and make up more than half of the earth's crust, flint and pebbles being the most common silicious stones.

Silica is insoluble in water, and cannot be dissolved by common acids; it is infusible alone, but can be melted by using a flux. [This was true until lately, but pure fused silica is now a commercial product.—Ed.]

We come now to the origin of silica. As we have already seen, silica is a compound of silicon and oxygen. Quartz is not what we call a native rock, and occurs principally in veins. The deepest-seated rock is granite, which is nearly three-fourths silica. It is believed that the heat and pressure of the flowage zone previously described separates out the silicon from the primitive rocks, and the eruptive forces project it upward and among fissures into the oxidizing zone, where it combines with the oxygen there present, forming what we know as quartz, filling veins for the reception of metallic minerals, gold, copper, nickel. Quartz has been well termed the mother of gold, since it forms the universal matrix, or shell, covering gold. However, quartz is not always mineralized, but often occurs in dykes, in the older formations, perfectly barren.

Silicate

We have dealt with calcareous rocks and what they are formed of. Now we come to silicates, the compounds of silica, with alumina, lime, magnesia, potash and iron oxides. We have ofttimes come across feldspar, which some call quartz, but feldspar is somewhat softer than quartz, and breaks in two directions, leaving a pearly flat crystal surface, and these characteristics will enable anyone to distinguish feldspar from quartz. Feldspar decomposes easily, and when mixed with very fine silica forms common clay. Pure feldspar sediment forms kaolin, from which porcelain is made.

Igneous and Aqueous Rocks

In our examination of the earth's crust, we find two kinds of rock, one formed by fire, known as igneous rock, the other formed by water, known as aqueous rock. As you all know, fire and water are two opposing agencies. Hence an aqueous rock brought into contact with the heat from the fiery furnace within the earth undergoes a change, so that it partakes of the nature of both, and is then called metamorphic, which means changed or altered rock, and we often find different rocks on the same range of hills and in our quarries.

*From a paper read before the (British) Institution of Quarry Managers by W. J. Evans F. G. S.

Aqueous rocks: These are so called from the *aqua* (Latin for "water"; aquamarine), which deposits sediment from decomposed rocks, forms regular layers that are sometimes called stratified or sedimentary rocks of which limestone is the most important.

Sandstone is a common form of the aqueous rock, and is composed mainly of sand pressed and dried by the earth's heat, so that when deep seated it forms a very dense rock.

Shale is simply clay, dried and compressed.

Slate, we are told, is simply shale subjected to long continued pressure, and baked by internal heat of the earth so that it splits into thin flakes.

Trap Rocks

We have dealt with the water-formed rocks. We will now deal with igneous rocks, fire formed. These have been thrown out of the earth's interior through openings while highly heated or in a molten state. Igneous rocks are not arranged in layers, hence they are called unstratified. They are sometimes made from the flowing mass. Igneous rocks are arranged in two classes, trap rocks and volcanic rocks. The word *trapa* is Swedish and means "stairs," as trap rocks are often found like stairs or stepping stones, or in the form of massive terraces or bluffs. The principal trap rocks are basalt, diorite and porphyry. You can often find fragments of basalt in six-sided prisms like a column, and this form of crystallization is very common to trap rocks everywhere. The famous rocks of the Giants' Causeway in Ireland are one of the most noted examples of massive trap rocks. We will leave basalt and touch a little on porphyry.

This rock was originally so named from a purple variety found in Egypt, and highly prized. The word porphyry is now used to mean any igneous rock containing feldspar crystals, and is of much importance to the mining man, as it is closely associated with mineral veins and ore deposits, though not usually found in the vein itself. As a matter of fact, there is a lot of talk about the porphyry belt found in Rhodesia, which carries rich gold, and is being closely prospected just now.

The general form of all trap rocks is that of a column having three to eight sides, from a few inches to many feet in length. Such pillars are often left standing several hundred feet high, and look like old castle ruins.

Volcanic Rocks

Coming to the volcanic rocks, there are two common varieties of volcanic rocks, trachyte and lava. Trachyte is so named from its rough, gritty feel. It is of porous, open structure, light in weight and has various colors running from white to gray and black. The cones of many extinct volcanoes are formed of trachyte. Rhyolite is a trachyte with quartz crystals, and has many different colors, generally of rough fracture, and often many lines from flowing while in a molten condition. All molten matter flowing from volcanoes is called lava. When lava cools, the upper portion of the stream is light and porous, while the under portion, cooling more slowly, is similar to basalt. Lava contains feldspar and pyroxene, and 100 different varieties have been found in the eruptions of Vesuvius. Pumice comes from volcanoes, and you can find it floating on the sea.

We have seen how an igneous rock may be disintegrated and washed down to a basin to become an aqueous rock. Now this is a complete change. When a sedimentary rock comes in contact with the intense heat and pressure of the earth's interior, it suffers a change, the principal agencies causing the change being heat, pressure and moisture.

Take for an example molten lava, running into sedimentary rock, it would alter its whole character. Clay would be changed into slate, limestone into marble and earthy rock like sandstone into quartzite.

In this metamorphic process, the stratification would be destroyed and the fossils partially blotted out, though sometimes an altered rock, as we have referred to, examined under a microscope will, I grant, apparently show a fossil. We see spangles of metal or mica, and often we find little nodules or lumps of ironstone enclosed. Imperfectly formed quartz crystals or garnets may be sprinkled throughout the mass.

Granite

Granite: What is it, and how is it formed? Granite is what is called an azoic rock. The word azoic means without-life, and applies to rocks so highly heated as to make life impossible in them, and are devoid of both animal and vegetable fossils, and as a rule lie at the bottom of all formations. Yet we find it capping the highest mountains. But there is a lot of difference in a newly quarried block of granite from the bottom beds and that granite which has been found capping the mountains which has been exposed to the weather through the long ages.

As a primitive rock, granite is a very hard and compact rock, but as a metamorphic or changed rock, which is its most abundant form, it is more or less fractured, so that it is often easily crushed and weathered.

The word granite is from *granum,* a grain, and indicates its granular structure.

The composition of granite is quartz, feldspar and mica, but metamorphic granite occurs in veins, hills and masses which were forced up through the crust in a moist, pasty condition and crystallized from contact with the cool atmosphere. Granite is always newer or younger than the rock it fissures. It just shows one that young life in nature will have its way, like the young men of our day; youth will always be so, and granite in the country where it occurs will be found pushing its way through the other rocks.

The fact that granite is composed of *nearly* the same elements as sandstone has led some geologists to conclude that most granite has been formed by metamorphosis of the sedimentary rocks. Have you ever noticed that where you find granite peaks they always appear in single well rounded summits; but basalt always appears as twins and with the tops flattened into cones?

Syenite is like granite in origin. It has great strength, and withstands an enormous pressure, and is generally grayish in color. That is due to its chief constituents, feldspar and hornblende quartz being absent or only present in small quantities.

Stratified Rocks

When the earth's crust was lifted up and dry land formed, it began to erode and crumble under the ceaseless action of rains, winds and water, the debris being carried down to the basins, where it was deposited in flat layers. If it had not been for the eruptions of igneous or fire formed rocks and uplifts of the crust, these rock strata would have remained just as formed, and it would have been impossible for us to read the earth's history as we now do by strata and fossils.

We are told that the rocks of the crust have not been penetrated by man more than a mile in depth in a perpendicular line, but fortunately we are able to examine the stratified rocks without going down into the earth, by reason of the work of nature, which has tilted them up on the edges. If we follow a deep chasm, or follow a river course in mountain regions, where there are numerous waterfalls, the rocks representing the successive ages previously described may be plainly seen, the older strata below and the younger on the higher points.

Build Plant to Produce Silica Brick in Ohio

PAUL BALLARD of Jackson, Ohio, has been appointed sales manager of the Ohio Quartz Corp.

The new firm, which is constructing a brick plant at the edge of Jackson, is already producing sand of high quality. The company was organized to produce fire brick from silica gravel, and work is going forward on the kilns and machinery.

Mr. Ballard will take up his new duties August 1.—*Wellston* (Ohio) *Sentinel.*

Proceedings of Sand-Lime Brick Convention

THE PROCEEDINGS of the 27th annual convention of the Sand-Lime Brick Association which was held at Atlanta, Ga., February 3-5, 1931, have been published in pamphlet form.

Included in the proceedings are the committee reports and the various papers presented, with the discussions on them.

Opportunities for Using Indicating and Recording Control Instruments in the Rock Products Industries

Part V — Application of Instrumental Control in High Temperature Work of the Automobile Industry

By James R. Withrow*
Chairman, the Chemical Engineering Department, Ohio State University

PREVIOUS ARTICLES have emphasized the opportunities for instrumentation in our rock products industries. Specific instances cited show that instrumentation has been a significant factor in the great strides taken by modern American industry. In Part IV we have shown the advantages of instrumentation to industry by giving specific cases from particular branches of the automobile industry. We will now develop what instrumentation at high temperatures has done for the automobile industry.

The Blast Furnace

Every automobile must come out of a blast furnace. Like other branches of the automotive industry described in the previous articles, the successful operation of the blast furnace needs instrumentation. At the Bethlehem Steel Co., four automatic hot-blast regulators were installed to control more sensitively the temperature of the hot blast main, thus to improve the quality of the iron produced and to obtain a reduction in the coke consumption.

An improvement in the quality of product was effected and a cut of about two points made in coke consumed, representing a reduction in production costs of 10c a ton. In addition there was a saving of $750 a month in labor costs. The reduction in labor costs is particularly noteworthy, for with the installation of the four regulators the number of hot-blast men employed was cut in half. One man could take care of two sets of stoves, whereas previously a man was required for each set. It was possible to reduce the working force by six men during the 24 hours, and the wages of the hot-blast men retained were increased $100 a month. The net results were:

1. Better quality iron.
2. Considerable reduction in coke consumption.
3. Reduction of 10c a ton in production costs.
4. A 13⅓% increase in the wages of the worker.
5. Net payroll cut of $750 a month, or $9000 a year.
6. Investment entailed for the regulators was $1960.
7. Reduction in labor cost alone yields a yearly return of 45% on the investment.

*The author is indebted to Dr. Cheih Ma of the Department of Chemical Engineering, Ohio State University, and to the Engineering Experiment Station, Ohio State University, for assistance in checking and organizing the notes from which this article was prepared.

Author's Note

IN THIS PART, further details, largely from the automobile industry, are given of specific instances showing definite advantages gained by the use of instrumentation. These specific illustrations are high temperature cases and show also the influence of the application of instrumental control upon the shortening of the production cycle. Indirect contributions from the automobile industry to the rock products industry as a result of instrumentation are obviously derived from steel treating and parts hardening. Attention is also called to a direct contribution from the automobile industry which is accruing to the rock products industry by the developments in roller bearings which are dependent upon instrumentation.

Steel-Treating

The steel-treating art is very ancient. The traditional tempering of the Damascus blade by plunging it into the body of a slave gave constant temperature conditions without the use of instrumental control. The body is of course a constant-temperature machine. Such methods, however, soon reached a limit of production.

New methods were required of the smiths of even very early times, when steel and copper entered more and more into mass warfare. When the Jats started migration from the mouth of the Indus and became the smiths of the Greeks, of Alexander, of the Romans, and of Medieval Europe, they, like their descendants the Gypsies, used other methods, but they were still limited to mere craftsmanship—highly useful as far as it went. Modern peace industry brought on real mass production and this demanded in-

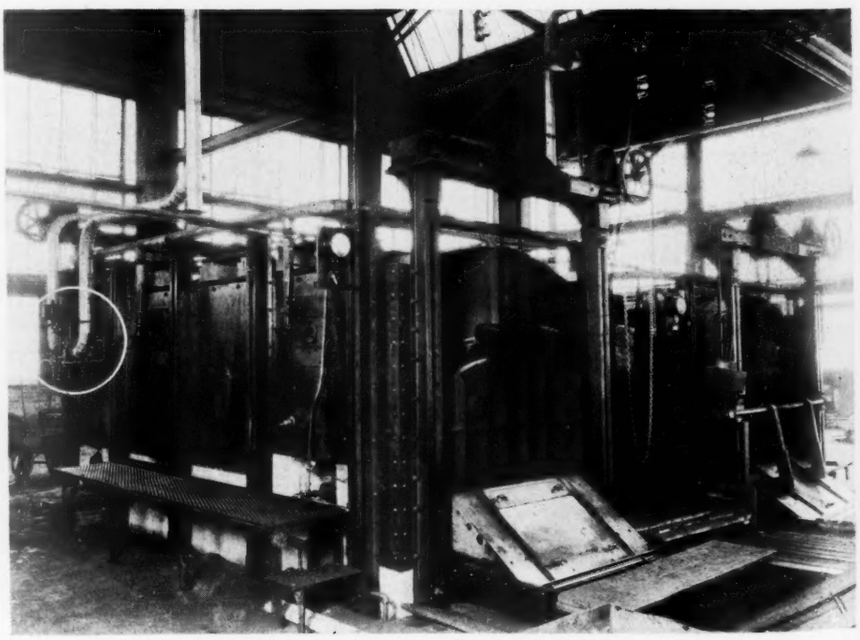


Fig. 16. Oil-fired heat-treating furnace for gears

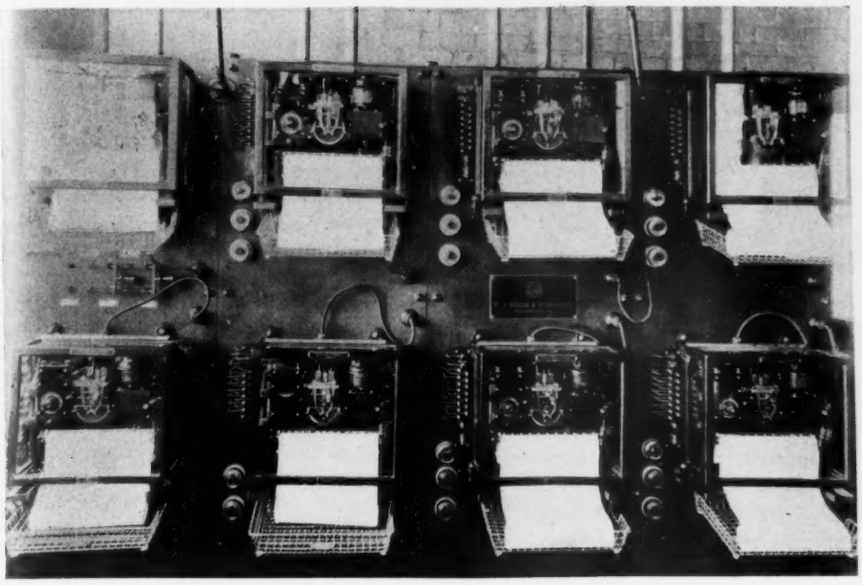


Fig. 17. Central control of all furnace temperatures

strumentation. The old smith forge was quite a different thing from the enormous modern heat-treating furnace.

An idea of the set-up compared with the old smith's forge where instrumentation controls modern heat-treating of steel is given by Fig. 16 (courtesy of Leeds and Northrup Co.), showing a large modern oil-fired heat-treating furnace for gears at a large gear manufacturing plant at Jackson, Mich. The circle at the left shows the valve mechanism for controlling oil supply. The whole is operated by automatic control through instrumentation, occupying a negligible space.

Fig. 17 (courtesy Leeds and Northrup Co.) illustrates the central control system. The temperatures of all the furnaces of the same gear manufacturing plant are controlled at a central point with automatic recording controllers, which give complete time-temperature records of all the furnaces.

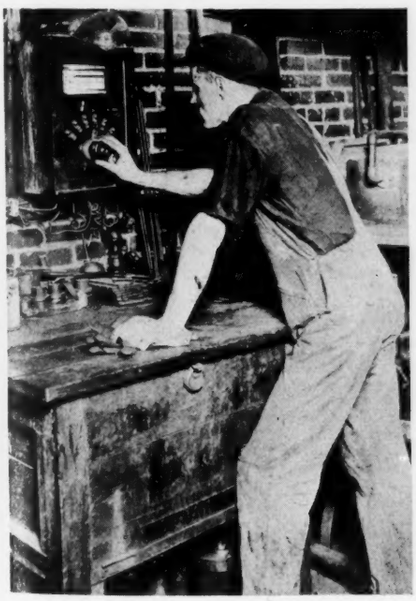


Fig. 18. Instrument control relieves workmen of responsibility

Steel treating, or heat treating, includes hardening, tempering, drawing and annealing, in various shades of differentiation. An example of the benefits of instrumentation to heat treating in industry is illustrated by manufacturers of cutlery and needles at Oakland, Calif. The installation of pyrometers in the tempering room resulted in a uniform product and a considerable economic saving. While the experienced workman may have splendid eyesight, failure to properly judge the temperature of even one batch of material would result in a loss far in excess of the cost of the pyrometers. Besides, the pyrometers relieve the workmen of some of the responsibility which would otherwise fall on them, and they have absolute dependence upon these instruments. Fig. 18 (courtesy Brown Instrument Co.) shows a workman reading the indicating pyrometer. It is possible also with the use of the pyrometer to arrange for the gas supply to be instantly reduced when a given temperature is reached. This results in a large saving of gas in the long run.

Another advantage is expressed by the research engineer at the plant of a Detroit steel casting company. He states that expert annealing with close attention to temperatures has saved many a casting. Automatic control pyrometers in this application insure close heat control, even temperatures, and reduced spoilage.

Another illustration is given in the core baking of a large radiator company at Uniontown, Penn. With the installation of 14 recording thermometers in the core ovens the core loss has reduced 5% and has taken guesswork entirely out of core baking.

The Allied Die Casting Corp. has installed 14 automatic control pyrometers as shown in Fig. 19 (courtesy Brown Instrument Co.), controlling the temperatures of the metal in the die-casting machines. This is very necessary, because, if the metal temperatures are too high, blow holes and oxidation will result. If too low, the metal will not properly fill the mold. Thus, with the use of these pyrometers the temperatures are always automatically at the correct point, saving time, labor and metal.

As a result of proper instrumentation in heat treating, the following reports were obtained from various companies:

One company reports 25% cut in fuel consumption.

One company reports a saving of $2642.80 a year.

One company reports saving in spoilage repaid the cost of instruments.

One company reports that pyrometers cost only 25c a day.

One company reports a spoilage saving of 10%.

One company reports that pyrometers cost only $101.10 a year.

One company reports a 10% saving in fuel and labor.

A manufacturer of pliers, punches, chisels, etc., in Newark, N. J., has been using automatic control pyrometers on its gas-fired hardening furnaces. When the furnaces are started up, the fuel is first by-passed and the gas and air adjusted by hand for complete combustion. The index on the instrument is then set to the temperature best suited for the article to be treated, usually about 800 deg. C. This temperature is predetermined by a critical point test. Nickel chromium thermocouples inserted through the top of the furnaces give the temperature of the furnace. When heated work is withdrawn from the furnace and cold work is inserted, the temperature drops, and the fuel is automatically thrown on. By means of this control the men are enabled to give 100% of their time to hardening the tools and can thus turn out better tools and a larger number of them. Due to the uniformity of the heat treating made possible by automatic control, the quality of the product has been appreciably raised.

For steel hardening baths the best results are obtained when the cooling liquid is kept

Fig. 19. These pyrometers control temperature of metal in die casting

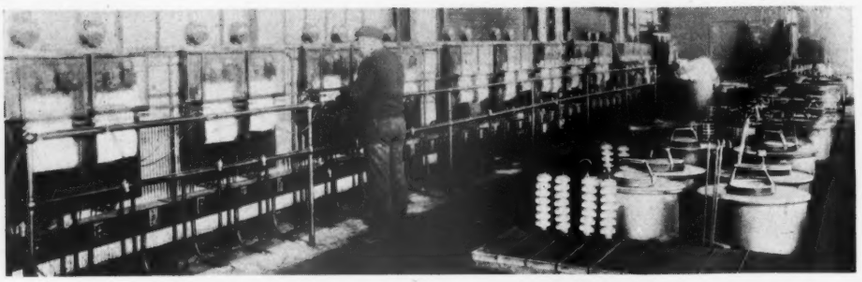


Fig. 20. Furnaces and recorders in a steel-treating plant

at a uniform temperature. For instance, water at a constant temperature of 80 deg. F. makes steel harder than it would be with the temperature of the bath fluctuating between 80 deg. F. and 150 deg. F. The latter temperature is sometimes reached, when the bath is in continuous use and no cooling water added, owing to the heating effect of the work. If a uniform temperature is maintained, checks and fissures in the product will be reduced to a minimum and the work will not have to be reheated or tempered a second time. Instrumentation is thus essential in the maintaining of this constant temperature. The usual method is by the addition of cold water. The quantity of heat is controlled by means of automatic temperature regulators. If, however, the bath is only used intermittently, there is the possibility of the temperature of the bath going below the proper temperature, and in this case heat has to be added to keep the temperature constant. This condition can also be controlled by the same regulator.

Many small parts which cannot be made by rolling, and which would not be strong enough if cast, are formed from properly preheated billets or bars by forging in dies under a drop hammer. The hammering not only shapes the piece but has a refining effect on the steel. Automobile connecting rods are usually drop-forged.

Billets or bars for drop forging are heated to temperatures ranging from 2250 deg. F. to 2350 deg. F. The rate of heating should not exceed 8 to 10 min. per inch of diameter. Annealing temperatures should not exceed 1200 deg. F. to 1300 deg. F.

Careful temperature control, therefore, is necessary in heating before forging and in the annealing process. This necessitates the use of instrumentation. Too rapid heating before forging, or too rapid cooling, may produce cracks or voids, owing to uneven plasticity and resulting stresses in the metal. Improper annealing means failure to remove existing stresses in the forged piece. The Brown control type indicating pyrometer is often used for annealing drop forgings in Advance oil-fired pusher type furnaces at such plants as the Federal Drop Forge Co., Lansing, Mich.

For the operation of the drop forge department of the Ford Motor Car Co., Detroit, Mich., there were approximately 84 electrical furnaces in operation, all of which are pyrometrically controlled.

Hardening of Parts

The automotive industry calls sharply to our attention the importance of every cog in a machine. Each part must perform the function designed for it, or the car fails. We really should have known this to be true for all mechanical equipment. At the bottom of the success of all our machinery, whether automotive or rock products, is the quality of material for a given function. This means heat treatment in most cases. The automobile industry has expanded and highly developed this art. All other machinery consuming industries are therefore profiting to the extent of millions of dollars in increased efficiency of equipment due to the new hardening art.

All the motor companies have this art highly developed. The Hudson Motor Car Co., Detroit, Mich., for instance, uses automatic recording temperature control on electric furnaces through which continuously moving steel rods are passed for hardening purposes. In order to harden steel to obtain the best product it is essential to maintain the temperature, during hardening, within narrow limits. This can only be accomplished by use of automatic temperature control devices operated from thermocouples, which are placed at intervals throughout the furnace. Each pyrometer, which controls an electric heating unit, is set to maintain a definite temperature. If the temperature is too high the automatic control throws the switch which disconnects the heating unit from the power line. Also, if the temperature is too low, the control operates to throw the heating unit on to the power line.

Fig. 20 (courtesy Leeds and Northrup Co.) shows that, delicate and sensitive as these temperature recording devices are, even the potentiometer types are often used right out in the factory itself. The illustration shows the Hump furnaces in a large steel treating plant in Muncie, Ind., with the temperature recording instruments just across the aisle from the furnaces for heat treating small parts with precision, with the steel worker consulting the record as the furnace produces it.

The Nash Motor Co., Kenosha, Wis., uses recording temperature control devices for operation of its rotary electric furnaces in which motor parts such as gears, etc., are processed. In this way the temperature is held constant within a range of 5 to 10 deg. F. at a temperature of approximately 1450 deg. F.

Thermocouples are placed at intervals in the furnace and leads brought out to the recorder. The recorder is set to maintain a constant temperature which is accomplished by means of the automatic operation of a set of switch control magnets connected in the furnace power line. An increase in tem-

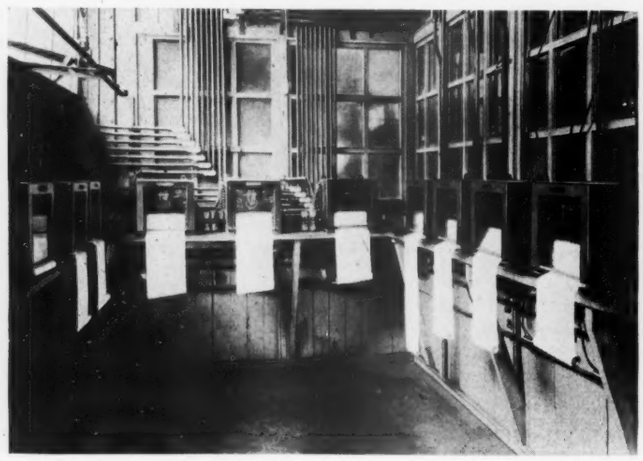


Fig. 21. Central control station in an automobile plant

Fig. 22. Signal lamps and deviation indicator

perature above that set on the control causes current to flow in the magnets, which, in turn, breaks the circuit on one of the heating units by throwing a switch. If the temperature is too low, then by similar operations the heating unit is thrown into the circuit again.

The advantages obtained are: (1) the operator is relieved of the duty of temperature control—reducing the number of operators required; (2) an accurate permanent record of operation is obtained—records can be used to check on defective products, for experimental work, etc.; (3) the morale of the operators is strengthened—reduction in labor turnover; (4) uniform products are produced—reducing rejections; (5) the time of processing is reduced—a saving in labor and power.

Fig. 21 (courtesy Leeds and Northrup Co.) shows 10 temperature recorders used in the central control station, Nash Motor Co., Kenosha, Wis.

Fig. 22 (courtesy Leeds and Northrup Co.) shows the use of signal lights and deviation indicator in connection with furnace operations in Nash Motor Co., Kenosha, Wis. In this way the operator is *instantly* notified of any deviation from the arranged temperature.

Fig. 23 (courtesy Leeds and Northrup Co.) illustrates a temperature recording and control panel in an automobile plant.

The extent of this steel treating in the automobile industry is shown by the fact that one forging machine manufacturer states that his machines have been responsible for the production of 6,000,000 automobile drag links. This machine does the whole forging job only because automatic heat treating is possible by instrumentation. The saving of labor is so enormous that the automobile industry could never have grown to its present gigantic size without this instrumentation.

These illustrations of the use of instrumental control and regulation of temperature, and others which will be described in the next part of this series of articles, are especially pertinent in suggesting practical applications of instrumentation in the rock products industry. In the preparation of cement, lime, gypsum, magnesia and silica and other rock products, accurate and close control in the burning or heating process of manufacturing these materials is essential to produce materials of the highest qualities. Probably at no time has the importance of economical production in our industry been greater, and the economies that have been shown to result with proper application of quality and production control with instruments might offer certain producers that opportunity for profit which they now lack. The possible saving cannot be considered as conjecture because of the experiences cited in industries with related problems. The next part will present further applications of instrumentation of a similar nature.

(To be continued)

Advertise Ready-Mixed Concrete in Newspaper

THE Superior Ready-Mixed Concrete Co., Cincinnati, Ohio, recently carried a full page in a local paper in conjunction with a material dealer. The advertisement described the Western Hills viaduct, an important construction project now under way and on which these organizations are furnishing their products.

The advertisement was directed to the advantages of ready-mixed concrete and the benefits to be had by its use. Two large illustrations of the equipment and an operation were shown.

Fig. 23. Temperature recording and control panel in an automobile plant

Gypsum, Lime and Alabastine, Canada, Wins Patent Suit

GYPSUM, LIME AND ALABASTINE, Canada, stands to benefit by a recent decision of the Privy Council upholding the validity of the Bayer patent of which the company holds the Canadian rights. The most important application of the patent is in the manufacture of gypsum wallboard.

The case in question, which has constituted the grounds for a three-year legal battle, was a suit by an American named Rice against a Danish firm which holds the patent taken out by Christian Bayer in 1921. It involves the manufacture of porous building materials by mixing certain ingredients with gypsum during manufacture.

About the same time Bayer made his discovery and obtained his patents, Rice discovered the same principle. Shortly afterward, Major George Thompson, chief research engineer of Gypsum, Lime and Alabastine, also discovered the process. His company then acquired the Bayer patent for Canada while competitors relied on the Rice patent.

Action was taken three years ago to nullify the Rice patent. The Canadian Exchequer Court found in favor of Rice; the Canadian superme court reversed this decision, and Rice in turn appealed to the Privy Council. This body has now confirmed the Bayer patent.

Loss of the suit might have meant a setback for Gypsum Lime and Alabastine. The patent plays an important part in the manufacture of wallboard made of gypsum; this product has been a prominent factor in the progress of Gypsum, Lime in recent years. It is the company's most important single item for Canadian consumption and also is exported to 35 countries outside Canada.

Earnings of Gypsum Lime for the first five months of the current year are reported to have fallen but slightly below those of the same period a year ago. Substantial cuts have been made in operating costs while the company is beginning to feel some of the benefits of expansion carried out last year.

Business conditions in the Maritimes are good, according to A. E. McLeod, Montreal manager of the company, who has returned from an extensive tour of those provinces.—*Financial* (Toronto, Ont.) *Post.*

Consumption of Explosives

REPORTS from 26 mills that sold more than 21 million lb. of permissibles and other high explosives in May (representing 87% of the total sales by all companies) showed that the mills were operated to 49% of their capacity in May as compared with 48% in April and 70% in May of last year. At the close of May the stock of explosives on hand represented 17% of one month's manufacturing capacity of the mills reporting as compared with 18% at the close of May, last year.

Relation Between Durability of Concrete and Durability of Aggregates

Abstract by Edmund Shaw
Contributing Editor, Rock Products

F. H. JACKSON, of the U. S. Bureau of Public Roads read a paper at the tenth annual meeting of the Highway Research Board on the relative durability of concrete and the aggregates from which it was made. It is a highly important problem, for, as the paper says:

"With the expanding use of concrete into many fields which involve exposure to the action of the elements, such as pavements, bridges, dams, stadiums, retaining walls, etc., has come the realization that designing for strength in accordance with the old accepted methods does not necessarily insure durability. This truth has been brought home many times during recent years by reason of the weathering of many exposed structures in which the concrete, measured by the conventional yardstick, strength, met every requirement."

No material is permanent, the paper points out, so that it will resist the forces of ordinary weathering forever. All we can ask of concrete is that it will be as resistant as we know how to make it to ordinary changes of the weather, as durability in this sense does not include resistance to distinctive agencies, as sea water, strong alkali and acid water. And the paper says:

"The function of the aggregate in contributing to the above end is the subject with which we are primarily concerned. The aggregate is, however, only one of a number of factors which influence durability. Moreover, the behavior of an aggregate in concrete may be quite markedly affected by these other variables so that a study of the aggregate factor in reality involves a study of all the variables, including both materials and methods of manufacture, which may contribute to durability or the lack of it."

Water the Most Important Factor

Apparently everybody is agreed that the most important role in disintegration is played by water. In many cases action of freezing and thawing "is of course purely mechanical, and is due to the formation of ice crystals within the pore spaces of the concrete, the resulting expansive forces eventually producting disruption. Attention has recently been called, however, to the possibility that such effects may in many cases be due to the deposition of crystals of chemical salts within the pore spaces of the concrete rather than to ice crystals. Anderegg has noted the possibility that even normal ground water may carry enough acid in solution to react with the constituents of the cement, forming crystal compounds, and that the growth of these crystals within the hardened concrete may easily produce the effects noted."

From this it is apparent the goal of everyone connected with making concrete should be to produce concrete which has the greatest possible resistance to the entrance of water, the selection of aggregates being only one step in the process. The aggregates must not only be sound and durable but they must be so graded as to produce concrete of plastic and workable consistency with the least amount of water in proportion to the amount of cement required.

Too much emphasis, the paper says, may have been placed on the character of the aggregate and not enough on the design and placing of the concrete. According to the committee of the A. C. I. which has been studying disintegration, the great majority of failures come in concrete that is not uniformly impermeable to water. Only a limited number of cases could be traced to a lack of durability in the aggregates, but there are enough of these cases to warrant a thorough investigation of the durability of aggregates before they are used in concrete.

Mr. Jackson believes it is necessary to attack the problem from the field and laboratory standpoint. Any test for durability which may be made on the aggregate is only of value in so far as it may be correlated with the durability of the concrete made from it. Hence research should be made on the concrete more than on the aggregates. The behavior of an aggregate in concrete may be influenced by such things as the water-cement ratio, the cement content, etc. It is quite possible that an aggregate unsatisfactory in a lean concrete may prove satisfactory when protected by the cement paste of a high quality in a rich concrete. On the other hand, when a high water-cement ratio is used, failure would be due to the poor quality of the cement paste, and would occur regardless of the aggregate used.

Freezing and Thawing Tests

Frost action is undoubtedly a most important factor in the weathering of concrete, but no effort has been made to standardize a freezing and thawing test of concrete. The paper discusses some variations in the sample that may affect the results, such as a surface molded against a form, or finished by a strike-off, or a sawed surface. Other variables may be the method of saturating and the temperature and rate of freezing. An outline of a recommended procedure in research of freezing and thawing is given. And it is recommended that all variables should be investigated with concrete made with five water-cement ratios, ranging from 0.6 to 1.0, and with combinations of cement and sand and coarse aggregates known to be satisfactory and coarse aggregates known to be unsatisfactory.

The paper suggests that a systematic field study should be carried out by some such disinterested agency as the Highway Research Board and that this should be correlated with laboratory work.

Thermal expansion should also be studied, as it has been suggested, according to the paper, that there is enough difference between the thermal coefficient of some aggregates and that of concrete to cause failure. Measurements should be made on such materials as flint, etc., using 1-in. cores, about 4 in. long, drilled from the material to be tested, on a comparator. The effect on concrete would be determined by many alterations in temperature (range about 100 deg. F.) on 6x12-in. cylinders. The size of the aggregate has to be taken into account. It might be found that aggregate which would be dangerous if the maximum size was 3 in. in diameter would be quite satisfactory with the maximum size of ¾ in.

Status of Sodium Sulphate Test

The paper includes the text of a statement prepared by A. T. Goldbeck, Stanton Walker, H. J. Love and Fred Hubbard, for the three aggregate associations, concerning the sodium sulphate soundness test. They found a good deal of fault with the procedure outlined in the U. S. Dept. Agri. Bulletin, 1216; that the sample is too small, source not definite; test applies to rock only and not to gravel and slag; no adaption to fine aggregates, and so on. A new procedure is suggested. By this every care must be taken to make the sample representative. It shall consist of at least 50 pieces between 2-in. and 1-in. square openings, or 2500 g. of material between 1-in. and ½-in. For fine

aggregates it shall consist of 1000 g. between any desired sieves, as 4- to 8-mesh or 14- to 28-mesh. The solution shall be 400 g. of anhydrous sodium sulphate or 900 g. of the decahydrate per liter of water. It shall be dissolved at 85 to 90 deg. F. and set aside 12 hours after use. The soaking period should continue for 19 hours, then the sample shall be examined and the removable portions set aside. The sample shall then be dried four hours at 212 to 225 deg. F. (The paper contains very full details of procedure in addition to what is given here.)

The interpretation of the tests is as follows:

"An individual specimen breaking into three or more portions (each portion being more than 10% of the original weight of the piece) or losing more than 20% of its weight by chipping or flaking shall be considered to have failed in the test. A sample having 20% or more of its pieces failing shall be considered unsound. Likewise, when 20% or more by weight of chips and flakes are formed during the test passing ½-in. screen (square openings) this shall constitute unsoundness in the sample. A sample shall be classed as of "doubtful soundness" when 15-20% of its pieces fail or if 15-20% of its weight is lost in chips and fragments. Such material shall be tested again for durability. If it is classed as "doubtful" the second time this behavior shall be construed to indicate the unsoundness of the sample.

"Materials for smaller aggregates and sand shall be classed as unsound when more than 20% by weight is reduced in size during the test to pass the original sample's lower sieve limit. At the end of the test the remaining portion of the sample shall be freed from Na_2SO_4 by a repeated boiling and soaking process, the wash water being renewed four or five times. After drying and weighing the total loss during the test is determined by the difference between the original and the final weights of the sample.

"Materials not failing above classification shall be considered sound.

"Materials failing shall not be used unless their durability has been demonstrated by service behavior."

British Tests on Aggregates

BRITISH AGGREGATE SPECIFICATIONS call for finer material than is generally used in the United States. The usual specifications, according to an article in the *Stone Trades Journal* (England), are:

"Aggregates may consist of hard stone or gravel, crushed or graded to necessary sizes. Generally, the material must pass through a ¾-in. sieve, but not through a 3/16-in. sieve.

"Sand must be a good, coarse pit sand free from loam, etc. (Usually British concrete sand is made through 3/16-in.)

Tests which are described in the paper were on materials found in Yorkshire, and generally considered too soft to be suitable. The gravel contained a large proportion of soft material and the stone was a rather soft and porous sandstone. The tests were made in the laboratory of Messrs. G. and T. Earle, the well known British manufacturers of portland cement, and their purpose was to determine if small amounts of soft and porous stone rendered the aggregate unfit for use.

All the concrete was mixed in 1:2:4 proportions or, as they write it in England, 4:2:1. The slumps were from ½-in. to 1-in. and the water content averaged around 0.80. The breaks were all made on 6-in. cubes, and no tests of flexural strength were reported.

The tests are given in detail and show 28-day strengths of 3000 to 4000 lb. in most cases. Concrete made from a good hard gravel gave the highest strength, but the strength was not so much greater than that developed by the gravel with soft pieces and the soft sandstone. All the strengths were much greater than demanded by the usual regulation which calls for 2400 lb. in 90 days.

The author draws several interesting conclusions, but that which seems to sum them up is: "The good aggregate gave the better result, but for ordinary working stresses the poor aggregate seems good enough." That is, with small amounts of shale, sandstone and other soft materials the strength was not sufficiently affected to render the concrete unfit for ordinary purposes. This, of course, corresponds to the conclusions of Professor Emmons and other American investigators of the effect of soft particles in aggregate.

Aggregates for Mat Coat on Highways

MAT COAT is distinct from oil surface treatment, according to H. C. Weathers of the State Road Department of Florida in a paper presented at the Ninth Annual Asphaltic Paving Conference. He says that it should be thoroughly bonded to the underlying surface, be so stable as not to corrugate or to shove under traffic, due to internal movement, and it should waterproof the underlying road from surface absorption. Mat surfaces are divided by him into three types. The first is the mixed in placed surface. The second uses a prepared base course covered with asphaltic oil and then 40 to 50 lb. of crushed slag, stone or gravel rolled in place. The third type places a bituminous mat built on an earth road with material which has been scraped from the road while preparing it for oiling.

In Florida there is an unlimited supply of soft lime rock which is placed on the subgrade to a depth of 10 or 11 in. and rolled to 8 in. Formerly the mat was of 40 lb. of slag uniformly graded from ¾- to ¼-in. (round openings) with asphaltic oil. This practice has now been modified by the use of heavier bituminous materials and lime rock of the following grading:

Passing 1-in. sieve, 100%.
Passing ¾-in. sieve, not less than 90%.
Passing ½-in. sieve, 20 to 60%.
Passing No. 4 mesh, 0 to 10%.

The covering coat of slag is put on as formerly.

Sand clay roads have been very successfully coated with mat coats. On some of them it has been found advisable to use about 2 cu. yd. of pea gravel per 100 lin. ft. of base. This is worked in by traffic with constant machining to keep the gravel distributed uniformly over the surface. [This is in effect the sand-gravel surfacing which has proven so successful in Kansas and other western states.—Editor.] The covering of asphaltic oil and slag is then put on as it is with the lime rock base. There are now 1907 miles of lime rock base with mat surfacing in Florida.

The average cost of maintainance this year is $16.10 per month per mile. For the sand clay road the maintenance cost is $24 per month per mile. In both cases approximately 25% is charged to surface, the remainder being for maintaining right-of-ways, road beds, structures, guard rails and signs.

The cost of the mat or carpet coat on either the lime rock or the sand clay base is about 19 c. per sq. yd.

To Develop New Mexico Rock Asphalt Deposit

CHEAPER road construction costs for state highways and lighter type residential streets will be possible with the use of Santa Rosa rock asphalt, large deposits of which will be developed by the New Mexico Construction Co., A. R. Hubenstreit, president, announced recently.

Mr. Hebenstreit recently announced that after experiments with the new asphalt materials discovered near Santa Rosa the company is ready to go ahead with development.

Mr. Hebenstreit said that 1000 acres of the asphalt is exposed, ready to be taken out. In all there are 6000 acres, it was determined after extensive diamond drilling.

Nearly $75,000 has been spent in the preliminary development. Part of the future development will be construction of a five miles railroad, but this is not immediately contemplated.—*New Mexico State Tribune.*

Report of California Highway Department

THE 7th biennial report of the division of highways of the state of California covering the first half of 1930 has been published. This 293-page illustrated report by C. H. Purcell, state highway engineer, Sacramento, to B. B. Meek, director of public works, gives full information on the work of the highway department and the status of all state highway programs.

Montana 500-Cu. Yd. Gravel Operation Changed From Shovel to Drag Scraper

Helena Sand and Gravel Co. an Example of a Thriving Small City Operation

By R. A. Goodwin
Sauerman Bros., Inc., Chicago, Ill.

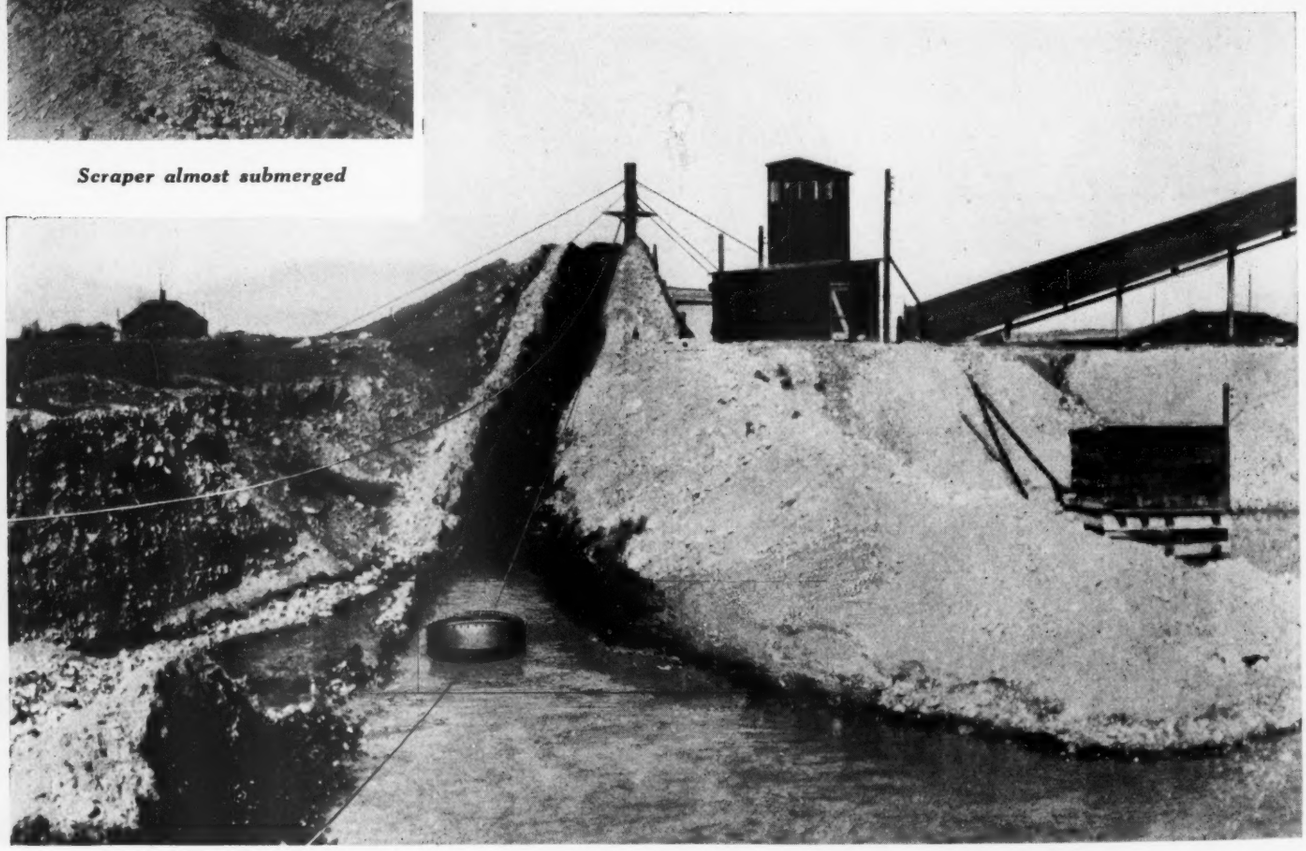
Scraper almost submerged

THREE YEARS AGO a large part of the business section of Helena, Mont., was destroyed by fire. George F. Jacoby, son of a prominent Helena contractor, realized that considerable quantities of concrete aggregates would be needed for rebuilding and accordingly erected a small plant to supply sand and gravel from a pit of excellent glacial material, some three miles from the city.

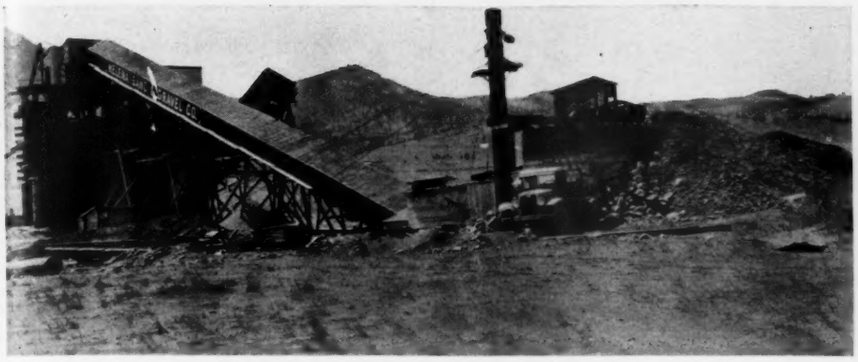
That was the start of a thriving sand and gravel business; in the summer of the following year, 1929, the small original plant was replaced by one larger and better equipped, which went into operation in August of that year. The washing and screening plant is operating today practically as originally designed, but changes were made in the excavating method and the source of washing water at the beginning of the present season.

The Helena Sand and Gravel Co., which Mr. Jacoby organized and of which he is president and manager, owns 40 acres of land at the plant site, along the main highway to Missoula, and on a spur line of the Northern Pacific railroad; the property is approximately square, and the plant is now located about midway of one side.

There is no overburden and the sand and gravel, consisting of about 35% sand and 65% rock, is exceptionally clean and free from impurities. Unwashed sand from the original pit was graded "A" by the state highway commission, and the product of the present plant has been tested and approved by all departments of government, state and city. Material can be produced to any de-



Material is excavated by 2-cu. yd. power drag scraper, working on a span of 300 ft.



Washing and screening section of Helena plant

sired specification and is sold for all ordinary commercial purposes, including railroad ballast, and the operation has the reputation of being one of the best commercial material sources in Montana.

top of the building, above the hoist, where the operator has a clear view of the scraper at any point along its span and can control it with accuracy.

Equipment for conveying, handling, crushing, screening and washing the sand and gravel, that is, all operations beyond the excavation, was supplied by the Smith Engineering Works, which also designed the plant. All motors are Westinghouse. The plant has a capacity of 500 cu. yd. per day and is operated by four men besides the plant foreman.

Crushing and Screening

The grizzly bars on which the drag scraper discharges are spaced at 10 in., and as only a few boulders run above that size, they are simply rolled off the grizzly and allowed to pile up. The undersize falls to a bin 5 ft. deep in the top of the hopper structure, and from here is fed by a 24-in. plate feeder to a 3-ft. by 5-ft. wedge-bar grizzly inclined at 40 deg., with bars spaced at 2 in. Undersize from this grizzly passes directly to the main belt conveyor, while the oversize is fed to a No. 10A primary gyratory crusher which reduces all rock to 3-in. or less; this crusher and the feeder are driven by a 40-hp. motor. The crushed material falls to a 24-in. inclined belt conveyor, on 214-ft. centers, which carries all material to the top of the main washing and screening plant.

There the raw material is fed to an 18-ft. Ajax rotary gravel washing screen consisting of an inner and an outer cylinder. The inner cylinder, which first receives the sand and gravel, along with the washing water, is 40 in. in diameter and consists of a 3-ft. blanked scrubbing section, a 4-ft. section with ¾-in. perforations (all perforations are round), a 7-ft. section with 1-in. perforations, and finally a 4-ft. section with per-

Pit now dug to 20 ft. below water

Scraper discharging on to grizzly

Originally a Shovel Operation

Originally the material for the plant was dug from the pit by a gasoline shovel which loaded a 4-cu. yd. automatic-dump car of a type used in underground mines. This car was pulled up an incline by a cable and discharged into a field hopper. This operation was discontined at the beginning of this year, however, because the skip conveyor lacked flexibility and the shovel was able to reach only the upper 16 ft. of the deposit lying above the water line. Excavation is now handled by a 2-cu. yd. Sauerman "Crescent" drag scraper, working on a span of 300-ft. radius from the headpost at the receiving hopper. The drag scraper at present has dug to a depth of about 36 ft., 20 ft. below water, without reaching the bottom of the workable material. Just how deep the deposit extends is not known.

The drag scraper pulls the material from the pit up a ramp to a grizzly at the top of a 10-ft. by 10-ft. concrete hopper and crusher house, 16 ft. above the surrounding ground. At one side of this structure stands the scraper hoist house, containing the drag scraper hoist and its 75-hp. Westinghouse electric motor. The hoist has line speeds of 200 and 600 f.p.m. and is operated by hand levers banked in a quadrant in a cab at the

Scraper head post and hoist house

forations of 1½ in., or larger as required. The outer cylinder, 55 in. in diameter, surrounds the 1-in. perforated section of the inner barrel and consists of 6 ft. of ¼-in. perforations and 4 ft. of ¾ in. Two cleaning rollers are provided outside the ¼-in. section. This screen and the main belt conveyor are driven by a 25-hp. motor.

Scraper Operation Provides Water Hole

Water for the scrubbing and screening was originally furnished from a well on the property, but since the installation of the drag scraper it has been taken directly from the pit. It is supplied by a 3½-in. centrifugal pump driven by a 25-hp. electric motor at 500 g.p.m.

Oversize from the rotary screen is spouted to a surge bin over a No. 32 gyratory reduction crusher which can be set to deliver whatever materials are most required. Material passing through this machine is returned by a 16-in. inclined belt conveyor, on 84-ft. centers, to the main conveyor, so that it is returned to the rotary screen for reclassifying. Both reduction crusher and secondary belt conveyor are driven by a 30-hp. motor.

Sand that passes through the ¼-in. perforations of the outer barrel of the washing and sizing screen is deflected by a baffle plate to a No. 6 and a No. 7 sand-settling tank, producing coarse and fine sand, respectively. Sized gravel and sand are chuted from the respective screen and settling tanks to six shipping bins, each holding about 60 cu. yd., and materials can be loaded out either through simplex or duplex bottom gates into railroad cars, or through side gates with loading chutes into trucks on a roadway alongside the plant.

Tom B. Brownlow, part owner of the Helena Sand and Gravel Co., is plant foreman in charge of the operation.

Mining Industry of Idaho

THE ANNUAL REPORT of the Idaho state inspector of mines, Stewart Campbell, has recently been issued. This report is a handbook of the mining industry of the state rather than a formal report. It reports the current status of mining in the state by county. This is followed by a brief survey of the several minerals produced or available in the state. A detailed report on operations in each county is then given.

In the nonmetallic group among those minerals found in Idaho and described in this report are asbestos (both chrysolite and amphibole), bentonite, diatomaceous earth, feldspar, graphite, gypsum, limestone, mica, phosphate rock and talc.

It is said that the greatest potential mineral resource in the state is the immense phosphate rock deposits in Bear Lake, Caribou, Bannock, Bingham and Bonneville counties. According to the U. S. Geological Survey Idaho has over 85% of the total phosphate resources of the United States.

Domestic Asbestos Output Higher in 1930

ACCORDING to figures compiled by the United States Bureau of Mines, Department of Commerce, from individual reports furnished by producers, the total quantity of commercial asbestos (figures available for chrysatile only) sold or used by producers in the United States in 1930 was 3653 short tons, valued at $273,292, as compared with 1983 tons, valued at $317,584, in 1929.

The total average value, per ton, of chrysotile in 1930, including all grades of crude and mill fiber, was $74.81. In 1929 the corresponding value was $160.15. The marked decline in average value in 1930 is partly accounted for by the decrease in production of high-grade crudes Nos. 1 and 2, mined only in Arizona, and by the increased production of the lower grades of mill fiber produced in Arizona, California, and Vermont.

The compilation of reports from three producers of anthophyllite (amphibole), mined in Georgia, Maryland, and Washington, indicates a decrease in both quantity and value of this type of asbestos in comparison with 1930. The average value, including high and low-grade material, was between $25 and $30 a ton.

The figures for both chrysotile and amphibole include high-grade and low-grade material.

The asbestos market in 1930 was characterized by overproduction, lessened demand, declining prices, and by the accumulation of considerable stocks at the end of the year. Canadian producers attempted some curtailment of production during the year, but the effort at stabilization was not entirely successful. The requirements of asbestos for new and improved uses were not sufficient to absorb the surplus reserves. Imports of asbestos in 1930 were 208,681 short tons, valued at $7,064,824, or 20.5% in quantity and 36.7% in value below those in 1929. Of particular interest was the sharp rise in receipts of high-grade crudes from Russia and the sale of this material at prices materially below those for immediately preceding years.

The accompanying table shows the imports of unmanufactured asbestos, for consumption, into the United States in 1929 and 1930, by countries, and the average values per ton.

Exports of unmanufactured asbestos in 1930 amounted to 952 short tons, valued at $95,318, compared with 709 tons, valued at $108,467 in 1929, or an increase in 1930 of 34% in quantity and a decrease of 12% in value.

The principal supplies of asbestos originate in Canada and Africa, Canada producing approximately more than 80% of the world's production. Smaller amounts are contributed by Cyprus, Russia, Italy, Japan, Finland, the United States, France, Australia, China, Argentina, and British India.

The United States is the largest consumer of asbestos in the world, but produces a very small percentage of its requirements—in 1930 only about 1.7%.

The apparent consumption of asbestos in the United States in 1930 is arrived at in the following manner:

	Short tons	Value
Production*	3,683	$ 273,292
Plus imports	208,681	7,064,824
	212,334	$7,338,116
Minus exports	952	95,318
Apparent consumption†	211,382	$7,242,798

*Exclusive of a small commercial production of amphibole.
†Exclusive of material withdrawn from stocks on hand at end of 1929, for use in 1930.

Iceland Spar and Optical Fluorite

BY FAR THE MOST important use of Iceland spar is for the manufacture of Nicol prisms. The Nicol prism is a device to provide a source of plane polarized light, and is used in many scientific instruments. The actual demand for Iceland spar is small, but the supplies of high-grade spar are so meager that the search for it is international in scope.

A discussion of the uses, physical properties, geology, markets and occurrences are contained in U. S. Bureau of Mines Information Circular 6468. Information is also contained in this circular on optical fluorite, an essential part of many lenses for scientific instruments.

ASBESTOS (UNMANUFACTURED) IMPORTED INTO THE UNITED STATES, 1929 AND 1930, BY COUNTRIES, IN SHORT TONS

Country	1929 Short tons	1929 Value Total	1929 Value Per ton	1930 Short tons	1930 Value Total	1930 Value Per ton
Africa:						
British-Union of South Africa	3,680	$ 585,240	$159.00	1,907	$ 297,749	$156.00
Portuguese-Mozambique	4,524	1,578,514	349.00	1,303	432,525	332.00
Belguim	348	55,125	158.00	.....	.....	.....
Canada*	252,067	8,363,541	33.00	200,068	5,466,783	27.00
France	.....	.....	.....	1	267	267.00
Germany	1,174	361,446	308.00	392	83,981	214.00
Italy	156	32,424	208.00	48	8,752	182.00
India, British	.....	.....	.....	1	55	55.00
Soviet Russia in Europe	252	111,290	442.00	4,534	660,559	146.00
United Kingdom	226	65,437	290.00	427	114,153	267.00
	262,427	$11,153,017	$ 42.50	208,681	$7,064,824	$ 33.85

*1930: Total imports of Canadian crudes, 1945 short tons, valued at $536,301; 1929: 6651 short tons, valued at $1,545,892.

Durability Studies of Aggregates and Concrete

By Edmund Shaw
Contributing Editor, Rock Products

H. F. GONNERMAN AND G. W. WARD, both of the Portland Cement Association Research Laboratory, presented a paper at the annual convention of Highway Officials of the North Atlantic States on "Durability Studies of Aggregates and Concrete." It is printed in full in the May issue of the *National Sand and Gravel Bulletin.* It is long, occupying 12 pages the size of this page, so that it can only be summarized.

Of the studies of soundness and durability which have been made recently, this is perhaps the widest, for it includes tests on 58 samples of fine and 47 samples of coarse aggregate. Both the sodium sulphate and the freezing and thawing tests were applied to the aggregates. Mortars were given 200 cycles of freezing and thawing. Tests on freezing and thawing concretes made from different coarse aggregates were still in progress when the paper was written. The water content in these tests varied over a wide range to show the effect of this factor.

Effects of Quality of Cement Paste

The outstanding feature of the tests, according to the paper, is the effect of the quality of the cement paste on the resistance of aggregates to freezing and thawing. When mixed with a paste of high quality (rich mix of low water content) aggregates which showed poorly in the soundness tests withstood 200 cycles of freezing and thawing without showing excessive failure. The paper says this is highly significant, not only in interpretation of durability tests but in pointing the way to proper construction.

Effect of Characteristics of Fine Aggregate

Grading and other characteristics of fine aggregates were found to have great influence on the resistance of mortar cubes to freezing and thawing. Each sand was found to have a definite maximum permissible water ratio. Some sound sands had such high water requirements for workability that they would not make durable mortars with the usual proportions, while others which were well graded made non-durable mortars because of structurally weak particles. Harsh gradings made porous mortars of low resistance to freezing and thawing.

There was a similarity in the manner in which failure occurred in the sodium sulphate and the freezing and thawing tests and generally three to four freezings produced equal failure to that of one sodium sulphate cycle. Aggregates broke down in different ways and the manner of failure as well as the amount should be taken into consideration in interpreting results.

Materials least resistant to direct soundness tests are: Shale, chert, argillaceous limestone and argillaceous sandstone. Shale and chert were most detrimental to mortar and concrete and the severer exposures should be avoided or restricted to small amounts.

Value of Tests for Predicting Durability

"At this stage of the investigation," to quote the paper, "it is not possible to predict the probable behavior of an aggregate in concrete or mortar solely on its behavior in the sodium sulphate or freezing and thawing tests. This must be interpreted in the light of the mineralogical composition of the aggregate tested." The value of the tests is in detecting structural weakness in aggregates and it is conservative to look with suspicion upon materials of poor behavior in the soundness test until they are proved suitable for use.

A permissible loss of 15 to 20% by weight at 5 cycles in sodium sulphate for coarse aggregates and 12 to 15% for fine aggregates may be considered reasonable in the light of our present knowledge. However, in fixing limits for specification purposes there should be considered: The quality of the concrete in which the aggregate is to be used, the type of exposure to which it is to be subjected, and the manner of the failure of the unsound aggregate. Some of the cherts, shales and similar laminated materials should be permitted only in small amounts. Dirty and coated aggregates are to be avoided, and the paper says of these: "It appears from our general studies that these, because of their detrimental effect on the quality of the cement paste, have a greater influence on the permanence of concrete than small amounts of unsound materials."

And the authors wisely add: "As significant and interesting as these studies are in showing the important effect of the aggregate in quality on the durability of concrete, they should not be allowed to divert attention from the necessity for proper construction methods. No amount of care in the selection of materials will produce durable concrete pavements unless the materials are properly proportioned, mixed and placed and opportunity is provided for ample curing." The importance of the quality of the cement paste is brought out in these tests and this means that not only should the water at the mixer be in proper quantity but that there should be nothing in the mixing and placing to unbalance the mix after it is in place. Anything that causes segregation or that brings water to the surface will result in greatly reduced resistance to wear and weather.

Helpful to Producers

The paper contains tables and diagrams which will be worth careful study by the producers of aggregates. In the main graph the sands are arranged in the order in which the mortars showed resistance to freezing and thawing at 80, 140 and 200 cycles, the water per sack being 4½, 5½, 7 and 9 gal. net. The fineness modulus and the loss in 5 cycles of sodium sulphate are plotted as parallel curves.

At 80 cycles all sands except Ottawa and one shaley sand showed about the same resistance to freezing and thawing in the 4½, 5½ and 7 gal. mixes. Ottawa sand with its uniform grading would naturally make a porous concrete. But in the 9 gal. mixes the disintegration was well advanced in some specimens. At 140 cycles the disintegration was well advanced and before 200 cycles was reached the disintegration of the 9-gal. specimens was complete. This seems sufficient proof that so high a water ratio as 9 gal. should never be used for durable concrete.

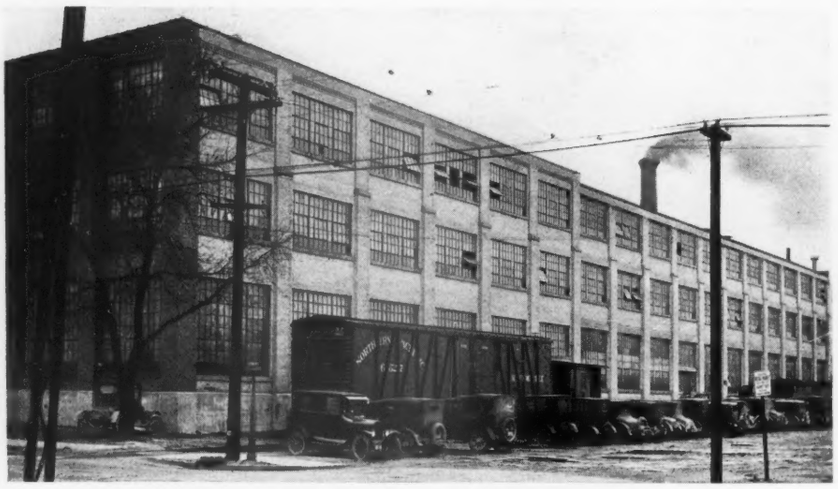
Valuable Tables and Curves

A table gives the results of a petrological count of these sands and the percentages of different unsound minerals. It is interesting to compare this with the chart showing disintegration. Of the sands disintegrating rapidly in mortars, one had 33.6% of shale and another 15.1% of shale. Even as little as 5.6% of shale appears to account for disintegration in a third. A fourth had 10.8% of chert and 12.2% of clayey sandstone. A fifth had 8.1% of clayey sandstone and a sixth 7.0% of weathered sandstone. (It should be remembered that Emmons and others have shown that some sandstones are excellent aggregates.—Editor.)

Of quite as deep interest to the user of aggregates, as well as to the producer, are the curves showing the water necessary to mix to constant consistency, since this greatly affects durability. A 1:3 mix with some sands gave the same consistency as a 1:4 mix with others, with the same amount of water. Naturally this would have an effect on durability. Some of the sands which stood up well in spite of containing unsound minerals apparently did so because the mortars were richer in cement. The table of permissible water ratios shows that some sands that might not serve in wet mixes would do very well with 4½ and 5½ gal. to a sack.

Manufacture and Merchandising of Sand-Lime Brick

By William P. Coleman



Plant of Macey Co., manufacturers of fine furniture, Grand Rapids, Mich.; 250,000 sand-lime brick used in construction

THE MERCHANDISING of sand-lime brick in the Grand Rapids, Mich., territory has been an uphill battle for the Grande Brick Co. of that city. But the task has borne fruit in that sand-lime brick is now written into the specifications of every building of importance, either as an alternative or as an exclusive brick. The city of Grand Rapids has long specified sand-lime brick almost exclusively on all construction work, above and below ground, thanks to the persistence and sales ability of the men engaged in this work.

Some of the opposition to the use of sand-lime brick was due to the natural resistance to change, but it must be admitted that another reason was the fact that some of the early sand-lime brick to come into this territory was not up to the standards of the Grande Brick Co. and occasioned much disappointment on the part of architects and builders.

Tests Make Sales

While the natural resistance to a new product could be beaten down in time by untiring and intelligent sales efforts, something more was required to gain the confidence of architects who had once been disappointed. Mere verbal representations would not suffice for them; the written findings of a disinterested third party, qualified to test the sand-lime brick and worthy of the confidence of architects and builders, was needed. Accordingly, the Grande Brick Co. retained the Robert W. Hunt Co., recognized testing engineers, to thoroughly test the sand-lime brick and submit its findings in writing. Samples of the brick were sent regularly to this company, and the resultant reports showed that sand-lime brick was worthy of specification in projects of brick construction. The result was that architects thawed out considerably. A Hunt company report, under date of September 13, 1930, is shown below.

Sand-lime brick has numerous qualities that appeal to architects, such as its ability to withstand fire that spalls and crumbles ordinary clay brick. It improves with age, has low porosity, slight heat conductivity, and practically no expansion from heat. It has a high crushing strength, will not scale, and will not disintegrate under climatic changes.

A number of buildings in the Grand Rapids area, constructed of sand-lime brick, have been gutted by fire and, except for a negligible amount of patching, the original walls have been used for rebuilding. One building was gutted twice, yet the original sand-lime brick was used in the second rebuilding! One fire was so intense that it melted the wire glass from the steel sash in the brick walls, but the walls failed to bulge or crack.

Sand-lime brick is favored by contractors who have used it, because the brick are of uniform size and color, do not require wetting, and absorb so little moisture that the mortar is not robbed of its strength.

The uses of the brick are many, including the construction of heavy factory, warehouse, and public buildings. It is adapted to and used for both exterior and interior walls, foundations, sewers, manholes, smokestacks, chimneys and wherever first-class building brick is required. The brick, being light in color, is ideal for inside walls and other construction where light is desired.

Milton P. Adams, formerly city engi-

ABSORPTION TEST

Dried to constant weight at 215-220 deg. F., then immersed five hours in water at 75 deg. F.

Laboratory specimen	1	2	3	4	5
Dry weight, pounds	4.44	4.47	4.48	4.38	4.32
Wet weight, pounds	5.03	4.96	4.98	4.935	4.855
Absorption, pounds	0.59	0.49	0.50	0.555	0.535
Absorption, per cent	13.3	11.0	11.2	12.7	12.4

FLEXURE TEST

Supported on 7-in. centers, loaded at middle

Laboratory specimen	6	7	8	8	10
Height, inches	2.29	2.32	2.27	2.28	2.30
Width, inches	3.75	3.75	3.76	3.76	3.74
Maximum load, pounds	937	849	1,160	1,218	1,148
Modulus of rupture, pounds per square inch	500	442	629	654	609

CRUSHING TEST

Half brick, laid flat

Laboratory specimen	11	12	13	14	15
Height, inches	3.78	3.76	3.75	3.75	3.74
Width, inches	2.27	2.35	2.25	2.27	2.26
Length, inches	3.35	4.35	4.20	3.95	4.06
Area under compression, square inches	7.60	10.22	9.45	8.97	9.18
Maximum load, pounds	30,780	34,930	37,660	33,770	27,890
Maximum unit load, pounds per square inch	4,050	3,420	3,985	3,765	3,040
Failure	Regular for all five specimens				

Marywood Academy, college for girls, Grand Rapids, Mich.; 600,000 sand-lime brick used

neer of Grand Rapids and now on the State Sanitary Commission, made numerous original tests with sand-lime brick and "found it satisfactory from the angles of permanence, compressive strength and porosity, and superior to common clay brick formerly manufactured in this city." He was responsible for sand-lime brick being used exclusively for manhole and sewer work in this city, and for its specification in the city's great sewage disposal plant, under construction since 1924, and the sewer reconstruction program requiring more than five million brick.

The company advertises its product in a general way in several mediums, but relies principally upon personal contacts with the field to promote active sales. The brick is sold through building material dealers.

Plant of the Grande Brick Co.

The plant of the Grande Brick Co. was erected in 1909, of sand-lime brick made on the ground, and after 22 years the walls look as clean and new as when first built. It is the only sand-lime brick plant in Grand Rapids and has an annual capacity of 20,000,000 brick. Most of the equipment used in it was supplied by the Jackson and Church Co., Saginaw, Mich. This consists of one rod mill, operated by a 50-hp. motor; 2 brick presses, each operated by a 10-hp. motor; 2 agitators, each operated by a 7½-hp. motor; and 2 feed hoppers, each operated by a 5-hp. motor. Steam for curing is furnished by two 150-hp. boilers, equipped with Jones underfeed stokers operated by a 7-hp. motor.

Lime Handling

The lime used is high calcium, not less than 94%, low calcium lime being barred because of its tendency to increase the thickness of brick beyond standard. The lime is carried up in a bucket elevator to bins above from which it is fed to the hydrator.

The hydrated lime is carried by a 12-in. screw conveyor, 85 ft. long, to one of five silos each with a capacity of 35 to 60 tons, where it is stored until needed. It is then taken out in an 8-in. screw conveyor and carried in a bucket elevator to a 25-ton storage hopper above the rod mill.

Sand Conveyed by Belt

Sand is dug from the bank with a Sauerman "Crescent," ½-yd., scraper which empties into a hopper and it is then carried by belt conveyor to a vibrating screen. The screened sand is carried up on a 156-ft. inclined belt conveyor to a reversible conveyor from which it is discharged into either the storage bin or the sand hopper, located in the plant directly behind the rod mill. The scraper is operated by means of a double-drum hoist, driven by a 30-hp. motor.

During winter months about a dozen well points, 1¼- by 30-in., are driven into the sand bank and connected up with a 2-in. line from the exhaust of the steam curing cylinders to thaw the sand.

Sand and lime are fed from the hoppers to the volumeter or proportioning device where they are proportioned to make a proper mixture and then conveyed to the rod mill. The average mix is 5 parts sand and 1 part lime, but this varies up to 6 parts sand and 1 part lime.

Rod Mill Operations

A cylindrical mill known as a rod mill is used for thoroughly mixing the raw materials. It contains about 45 round steel rods of 2-in. to 4-in. diameter and 10 ft. long aggregating about 5 tons which do the mixing and a certain amount of grinding.

During cold weather the sand-lime mixture sometimes freezes on the wall of the mill so that it is necessary to open it up and pound the sand-lime mixture off in chunks. For this reason, it is operated in cold weather with considerably less rods.

The rod mill discharges the sand-lime mixture on to a short belt conveyor which passes under a magnetic pulley. This pulley, which will lift pieces of iron weighing eight to ten pounds, removes the "tramp" iron such as stray nuts, bolts, wrenches and other things that get lost around a plant or that might have been imbedded in the sand bank. After passing

Factory of Grand Rapids Steel Products Co., manufacturers of steel furniture; 450,000 sand-lime brick used in construction

Hayes Body Corp., manufacturers of automobile bodies, Grand Rapids, Mich.; 1,100,000 sand-lime brick used in construction of building

the magnetic pulley, the material is carried up in a bucket elevator and discharged to the feed hoppers above each brick press.

In the bottom of these feed hoppers a disc or table, revolved by a 5-hp. motor, feeds the material into an agitator pan from which it falls to the molds. The agitator pan has two steel arms to which are bolted manganese steel blades and which are revolved at 90 r.p.m. by a 7½-hp. motor. In this pan a steel float connected to a gate at the bottom of the feed hopper controls the amount of material fed into the agitator.

Molding the Brick

The brick are molded or pressed into form by a rotary table press manufactured by Jackson and Church Co., Saginaw, Mich. The press has a circular table with 12 pockets in which 12 plungers are moved up and down as the table is revolved. After each pocket is filled with the sand-lime mixture it is subjected to a pressure of from 5 to 8 tons per sq. in. and the pressed brick is pushed up out of the pocket by the plunger so that it may be removed by the operator.

Each Machine Makes 60 Brick per Minute

Each press will make 60 brick per minute, or about 36,000 brick in a 10-hr. day. These brick measure 2¼ in. by 3¾ in. by 8 in. and weigh when hardened 4,205 lb. per thousand.

Two men working together remove the brick from the press to small factory cars, which are each loaded with 1225 brick. When loaded each car is pushed on to a transfer truck and moved to one of the five steam curing cylinders.

Steam Curing Cylinders

Each cylinder is 6½ ft. by 56 ft. and holds 13 factory cars of 1225 brick each, or a total of 16,000 brick. The cars are pushed in on a narrow gage track permanently bolted into each cylinder and when filled the 2½-ton cylinder head is put in place by means of a chain hoist and fastened tight with forty-eight 2-in. bolts.

Steam at 120 to 125-lb. pressure is turned into the cylinder and the brick are steam-cured for 10 hr. The steam is then shut off and the cylinder allowed to cool for another six hours, as part of the hardening process. When removed, the brick are ready for use. The cylinder head is then removed and the cars are run out on tracks and the brick stored under a shed to await demand. This storage shed will house about 500,000 brick. Trucks are loaded by hand, but carload orders are handled with Matthews gravity carriers.

Testing the Brick

Brick from each cylinder are tested on a Morehouse hydraulic brick tester. The average breaking load at this time is 1350 lb. This corresponds to a modulus rupture of 746 lb., whereas the U. S. Bureau of standards only prescribes a modulus of rupture of 450 lb.

This plant was started by John L. Jackson of Saginaw, Mich., who, because of his untiring efforts over many years to improve both sand-lime brick and the machinery for making it, has been called the "daddy" of the sand-lime brick industry. After serving as president for a good many years he was succeeded by Jackson W. Van Brunt, who is now president. G. H. Nichols is superintendent.

Sand-Lime Brick Production and Shipments in July

THE FOLLOWING DATA are compiled from reports received direct from 20 producers of sand-lime brick, located in various parts of the United States and Canada. The number of plants reporting is the same as for the June estimate, published in the July 18 issue. The statistics below may be regarded as representative of the entire industry in the United States and Canada.

Reports for the month of July indicate that production has decreased considerably, nine plants reporting "no brick produced this month." Unfilled orders show a slight increase as do rail shipments. Truck shipments, however, show a decrease. Stocks on hand remain about the same.

Average Prices for July

Shipping point	Plant price	Delivered
Atlantic City, N. J.	$10.00	$14.00
Dearborn, Mich.	13.00	14.50
Detroit, Mich.	.....	15.50
East Windsor, Can.	14.50	.....
Grand Rapids, Mich.	.....	13.50
Iona, N. J.	11.00	15.00
Jackson, Mich.	13.00	.....
Minneapolis, Minn.	8.50	10.50
Mishawaka, Ind.	11.00	.....
Pontiac, Mich.	13.50	15.50
Saginaw, Mich.	12.00	.....
Sioux Falls, S. D.	12.50	.....
Syracuse, N. Y.	18.00	20.00
Tampa, Fla.	8.50	.....

Statistics for June and July

	*June	†July
Production	6,663,656	4,295,386
Shipments (rail)	494,350	528,980
Shipments (truck)	5,757,820	4,304,821
Stocks on hand	8,974,809	8,787,107
Unfilled orders	9,960,000	10,410,000

*Twenty plants reporting. Incomplete, six not reporting unfilled orders.
†Twenty plants reporting. Incomplete, eight not reporting unfilled orders.

Notes from Producers

Sioux Falls Pressed Brick Co., Sioux Falls, S. D., reports that contracts have been awarded for the construction of a postoffice and that approximately 120,000 of its brick will be used, commencing August 15.

June Asbestos Shipments from Canada

LITTLE IMPROVEMENT is seen in the shipments of asbestos from Thetford, Black Lake, Coleraine and East Broughton, Canada, during June. While the total amount shipped corresponds closely to that of the preceding month, it shows an appreciable decline from last June.

Following are the shipments of asbestos for June, 1931, with comparative figures for the same month of 1930 in brackets: Crude No. 1, 21 tons (20); Crude No. 2, 16 tons (162); Fiber, 4,319 tons (5,824); Shorts in bags, 3,733 tons (5,698).—*Toronto* (Canada) *Financial Post.*

Phosphate Rock in 1930

WITH OCCASIONAL EXCEPTIONS, the marketed production of phosphate mined in the United States has been steadily increasing. In 1930 the sales of this commodity reached the highest point in the history of the industry during the past decade.

According to a statement by the United States Bureau of Mines, Department of Commerce, based on figures compiled from individual reports of the producers, the total quantity of phosphate rock sold or used in the United States in 1930 was 3,926,392 long tons, valued at $13,996,830. In comparison with 1929, these figures represent increases of 4.4% in quantity and 6.4% in value. The average value per ton in 1930 was $3.98, as compared with $4.02 in 1929.

The quantity and value, by states, of the various kinds of phosphate rock sold or used by producers in 1929 and 1930, the average values per ton, and the amount of stocks on hand December 31, for those years, were as shown below.

Imports and Exports

Imports of phosphate rock, crude (general imports) into the United States in 1930 of 32,658 long tons, valued at $377,177, showed decreases of 27.3% in quantity and 19.6% in value, as compared with 1929. Imports from Morocco (French) into the United States decreased 63.4% in quantity and 68.8% in value, as compared with 1929. Inasmuch as the production of phosphate rock in French Morocco increased 10.6% over 1929, it is quite evident that shipments from this country were materially diverted from the United States into other channels — probably Europe, thereby increasing the competition between Moroccan and American phosphates entering Europe. Imports from all other countries into the United States showed increases as compared with 1929. These include Canada, Cuba, and French Oceania.

Total exports of phosphate rock from the United States in 1930 (1,225,722 long tons) were greater than for any year since 1913, when 1,366,508 tons was exported, and accounted for 31.2% of the total marketed production of domestic phosphate rock. In comparison with 1929 the figures indicate an increase in quantity of 7.3%. In 1929 exports of phosphate rock from the United States increased 27% in quantity over 1928.

World Production

The following data show the countries in which phosphate rock was produced in 1929 and 1930, in so far as figures are available:

	1929 Metric tons	1930 Metric tons
Algeria	747,035	845,961
Australia, New South Wales	71	26
Canada	1,075	36
Christmas Islands (Straits Settlements)	119,756	121,858
Egypt	215,311	313,478
Makatea Island	242,990	176,075
Morocco, French	1,608,249	1,779,008
Nauru and Ocean Islands	585,844	512,265
Netherland West Indies: Curacao	103,289	87,497
Poland	39,294	40,000
Tunisia	2,511,000	3,326,000
United States (sold or used by producers)	3,821,217	3,989,411

Domestic Consumption

The apparent consumption of phosphate rock in the United States in long tons in 1929 and 1930 is tabulated below.

PRODUCTION AND SHIPMENTS OF PHOSPHATE ROCK IN 1930

State	Mine production	Shipments: Long tons	Shipments: Value: Total	Shipments: Value: Average	Stocks, long tons: Dry	Stocks, long tons: Wet
Florida:						
Hard rock	74,338	81,753	$ 517,229	$6.33	21,388	47,787
Land pebble	3,187,201	3,166,318	10,273,076	3.24	165,287	563,517
Soft rock	*	*	*	.....	*	*
1930	3,261,539	3,248,071	10,790,305	3.32	186,675	611,304
1929	3,125,941	3,088,298	9,901,074	3.21	181,984	508,225
Idaho (Western rock):						
1930	64,129	59,932	234,543	3.91	1,890	161
1929	39,022	35,899	141,931	3.95	1,155	464
Montana (Western rock):						
1930	6,005	6,005	27,457	4.57	.....	.....
1929†	40	40	400	10.00	.....	.....
Tennessee (Brown and blue rock):						
1930	618,341	611,045	2,938,525	4.81	51,872	116,308
1929	653,265	633,939	3,079,104	4.86	42,278	125,534
Wyoming (Western rock):						
1930	1,339	1,339	6,000	4.48	89	446
1929	3,572	2,679	12,750	4.76	89	804
Grand total, 1930	3,951,353	3,926,392	13,996,830	3.56	240,526	728,219
1929	3,821,840	3,760,855	13,153,259	3.50	225,506	635,027

*Included with land pebble. †Figures represent one shipment high-grade for experimental purposes.

DOMESTIC CONSUMPTION OF PHOSPHATE ROCK

	Marketed production	Imports	Exports	*Total apparent calculated consumption	†Domestic rock
1930	3,926,392	32,658	1,225,722	2,733,328	2,700,670
1929	3,760,855	44,899	1,142,746	2,663,008	2,618,109

*Marketed production plus imports minus exports. †Marketed production minus exports.

Ohio Governor Eliminates State Geological Survey

THROUGH THE VETO of Governor George White of Ohio, the entire appropriation of the Geological Survey for 1932 was eliminated, thereby junking the organization and all of its activities, an organization which has given continuous service for more than 60 years. The entire amount allowed by the legislature for the geological survey for the year was only $15,500.

The work carried on by the survey has been a help to all of those industries which are based on the mineral resources. Investigations have been made on the stratigraphic relations of the rock formations, on the extent of various deposits, on the nature and composition of the materials, and on their fitness for useful products. These studies have included coal, clay, oil, gas, shale, limestone, sandstone, conglomerate, gypsum, marl, peat, iron ore, salt, and brine.

Ohio's mineral resources are normally valued at more than $200,000,000 annually, which valuation gives the state sixth rank in the United States.

Pacific Island Phosphate Production Is Curtailed

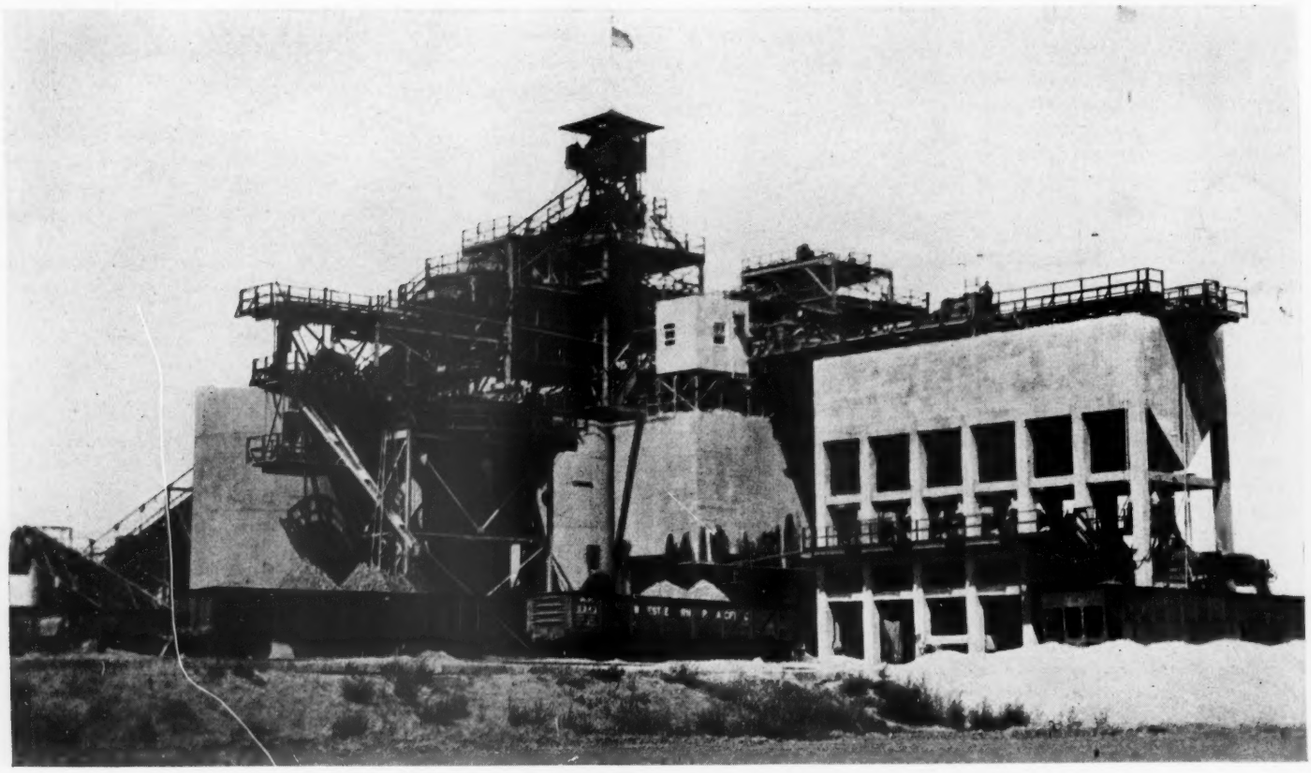
THE British Phosphate Commission controlling the output of phosphate rock from Nauru and Ocean Islands in the Pacific has announced that, for the first time in ten years, production is being curtailed at Ocean Island. It is reputed that the demand for phosphates for Australia and New Zealand has declined due to the inability of farmers to purchase normal supplies, and orders for superphosphate throughout Australia are understood to be about 50% of normal.—*American Fertilizer.*

Domestic Asbestos Output

COMMERCIAL production of chrysotile asbestos in the United States in 1930 increased 84% in quantity, but declined 14% in total value in comparison with 1929, reports the Department of Commerce. Total quantity of chrysotile sold or used by producers in the United States in 1930 was 3,653 short tons.

Export Opportunities

WHAT THE WORLD WANTS is the title of a recent bulletin of the U. S. Department of Commerce. It lists specific inquiries for American goods received in the department. These inquiries are classified. There are few items of direct interest to the rock products industry. Under minerals, however, is an inquiry 53000 for cement from Parahyba, Brazil. Detailed information on inquiries that have reached the department may be had without charge upon application to any branch office of the Bureau of Foreign and Domestic Commerce.



General view of plant with loading bins at right

New Sand and Gravel Plant in the San Francisco District

Pleasanton Plant of Kaiser Paving Co., Oakland, Calif., Has a Number of Unusual and Interesting Features

THE NEW PLANT of the Kaiser Paving Co. which was completed and put into operation in January, 1931, to supply aggregates for the San Francisco district, is unique in several respects. It is also interesting as showing in a general way the type of plant or at least the plant principles which will probably be used in producing aggregates for the Boulder Dam.

Of particular interest are the measures taken to insure thorough washing and accurate grading of the finished material so that aggregates may be turned out to meet the most exacting specifications as to uniformity and cleanliness. Here the gravel is segregated into its various sizes and stocked thus after one washing rather than as a finished product. It is then recombined and blended to the desired grading and given two additional washings just prior to loading into cars. In this way a very clean product is obtained with an accurate grading as to fineness.

The method used is briefly as follows: The gravel is separated into six different sizes over vibrating screens and is at the same time washed by spraying. This separation is begun at the ¾-in point by removing the sand and the oversize and then sizing the plus ¾-in. material over one set of screens and the minus ¾-in. sizes over another set of screens.

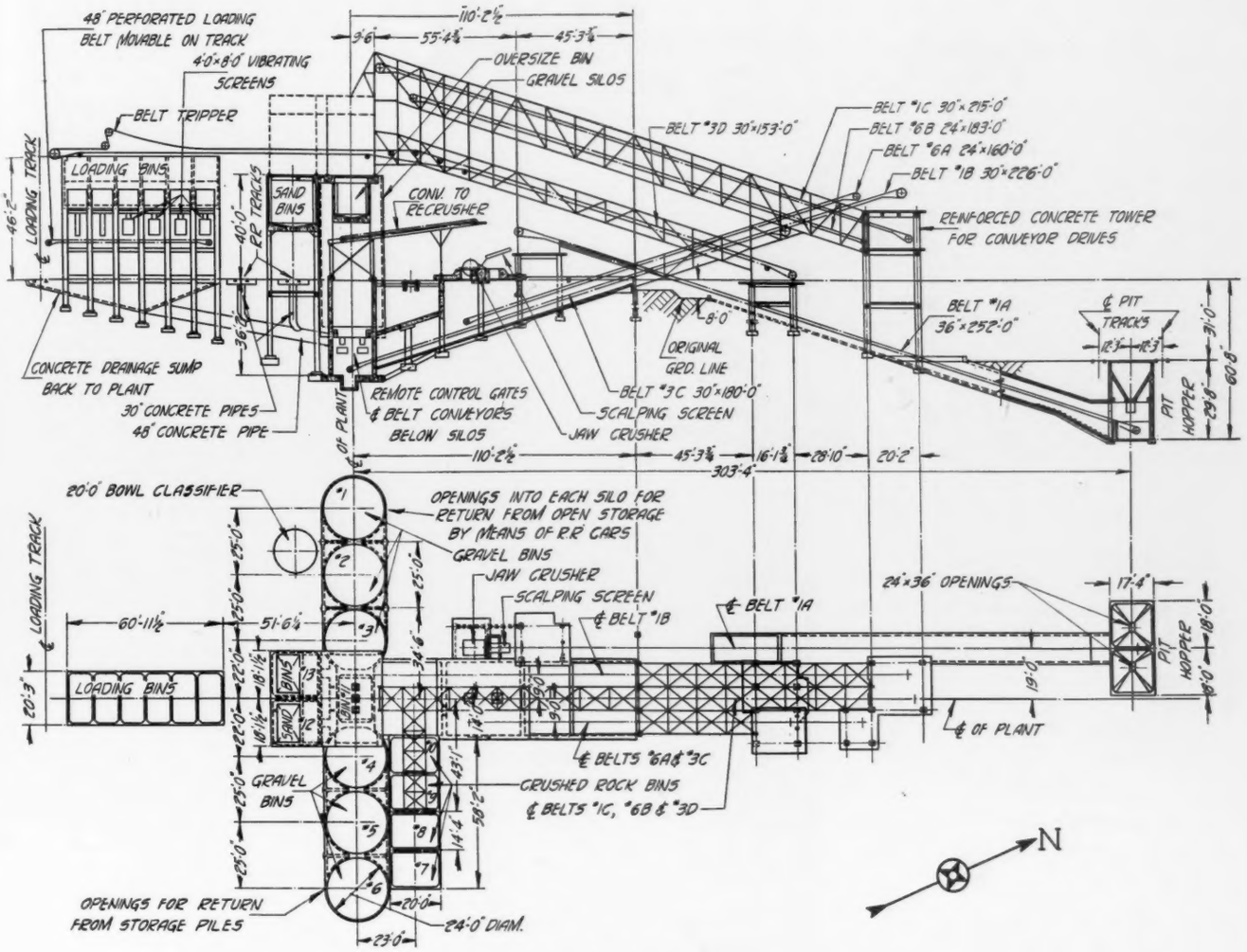
The sand is removed at several points and flumed to a system of bowl washers and classifiers arranged so that it may be blended to give any desired gradation. The six gravel sizes fall to storage silos from which they are drawn one at a time and conveyed to a set of six loading bins containing the corresponding sizes. Below these bins the gravel is passed over vibrating screens with jets for washing and on to a perforated loading belt conveyor also arranged with jets, the different sizes being combined to give the desired gradation. Thus the gravel is washed and dewatered three times and is blended at the loading point to meet the grading requirements.

Vibrating screens and belt conveyors are used throughout for all screening and handling. All units are driven by individual motors through gear reducers or V-type belt drives with automatic starters and push button control and are electrically interconnected so that the stopping of any unit automatically stops all other units feeding material to it.

The conveying and screening equipment for filling the silos is push button controlled by one man in the tower at the top of the plant, while the equipment for filling the loading bins is likewise push button controlled by one man from the top of the loading bins. Crushed gravel is handled in a separate set of bins, from which it is also washed and loaded to cars on a perforated belt conveyor.

The plant is of steel and reinforced concrete construction, all bins being of concrete and the superstructure and conveyor galleries steel. It is located just east of Pleasanton, about 40 mi. southeast of Oakland, and is served by both the Southern Pacific and Western Pacific railroads.

The plant was designed and built under



General plan and elevation

the supervision of Thos. M. Price, who is in general charge of production.

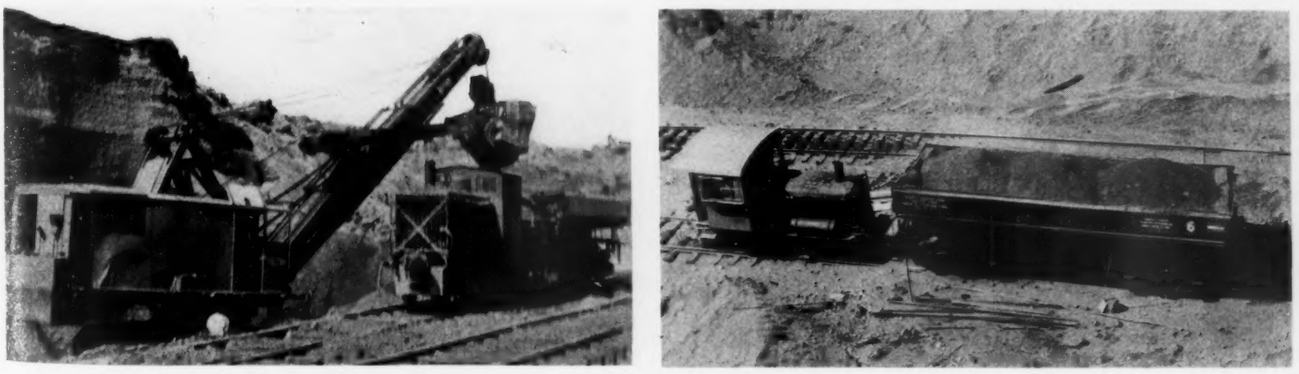
In order to obtain gravity trackage from the plant to the railroad lines, to secure better drainage, and reduce excavating costs, the tracks and grade line at the plant were put in 8 ft. above the original ground line.

Because of the nearness of the deposit to the railroads and the limited space available, the plant was confined somewhat instead of being being spread out. Thus the three conveyors carrying to the top of the plant are each in two units, the first units running up part way in a direction away from the building and discharging to the second units running in the opposite direction to the top. This gives the effect of a multiplicity of conveyors, although as a matter of fact they are simply in shorter units.

Gravel Pit

The gravel deposit is the lower part of the Arroyo del Valle wash, on the upper part of which four other plants have been operated previous to this one. It has a depth of about 50 ft. and runs approximately 60% gravel and 40% sand, with about 3 ft. of overburden which is removed by a shovel and trucks under contract.

Excavating and loading is done with a 3-yd. P. and H. electric shovel and a 2-yd. Koehring shovel powered by an Atlas diesel engine, both crawler type.



Two views in the pit; at left, electric shovel loading to car; at right, car at pit hopper

The other end of the pit, showing Diesel engine-operated shovel

These load to 20-yd., 40-ton capacity, Western air-dump standard gage cars which are moved to a pit hopper by locomotives. Three cars are used in connection with three Plymouth locomotives, two 12-ton Atlas diesels and one gasoline. The cars are dumped into either side of the pit hopper, the top of which is 25 ft. below ground line and from which the material is elevated by belt conveyor to the screening and washing plant.

Main Plant

From the pit hopper the material is fed by two 24-in. reciprocating plate feeders to a 36-in. inclined belt conveyor which carries above ground to a scalping screen for the removal of the oversize material. The screen is a Symons rocking bar type grizzly with manganese steel bars and 4-in. openings.

The plus 4-in. material passing over the screen falls to an 18-in. by 30-in. Allis-Chalmers jaw crusher where it is crushed and joins the minus 4-in. material which has passed through the screen. It is then carried on a 30-in. inclined belt conveyor to a transfer tower and discharged to a second 30-in. inclined conveyor which carries up to two parallel 4-ft. by 10-ft. double deck Robins "Gyrex" screens at the top of the screen house. Here used water pumped from the sand classifier overflow is added and the material is sluiced from the head of the conveyor to the screens.

These screens, with 2½-in. openings in the top deck and ¾-in. openings in the bottom deck and with jets for washing, make the first separation of the material. Any oversize (plus 2½-in.) goes to a bin from which it may be drawn as desired to a recrusher.

The ¾-in. by 2½-in. material passing over the lower deck is carried by belt conveyor to the coarse end of the plant for further sizing, while the minus ¾-in. material passing through the lower deck is spouted to two parallel 4-ft. by 8-ft. single deck Robins "Gyrex" vibrating screens fitted with wire cloth of .206-in. openings, where the fine gravel and sand are separated. The ¼-in. by ¾-in. gravel is carried by belt conveyor to the fine end of the plant and the sand is flumed to a 12-ft. Dorr sand washer.

Top of loading bins

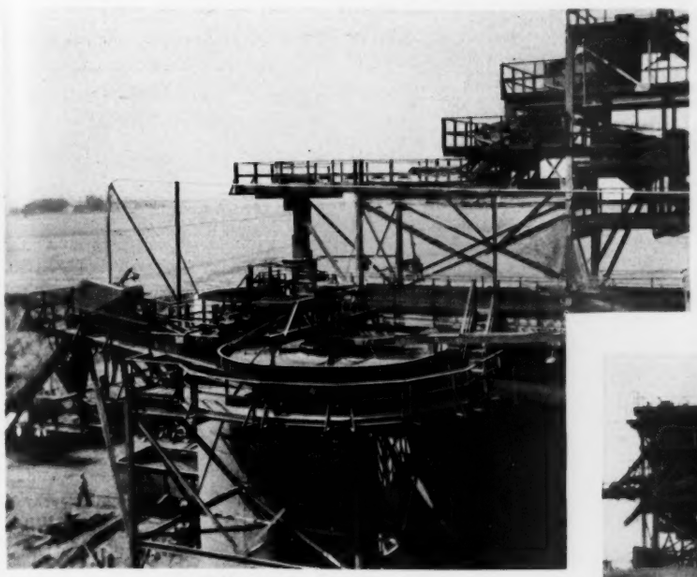
At the coarse end of the plant the ¾-in. by 2½-in. material passes over a 4-ft. by 12-ft. double deck Symons rocker arm oscillating screen with 1¼-in. openings, from which the 1¼-in. by 2½-in. gravel is spouted to another Symons screen with 1½-in. openings where two bin sizes are made, 1½-in. by 2½-in. and 1¼-in. by 1½-in.

The minus 1¼-in. material passing through the first screen is spouted to a 4-ft. by 8-ft. double deck Robins "Gyrex" screen with ¾-in. openings on the top deck and .206-in. openings on the bottom deck, where the next bin size, ¾-in. by 1¼-in., is made. Any sand through the lower deck is flumed to a Dorr classifier and any ¼-in. by ¾-in. material is spouted to the belt conveyor carrying over to the fine end of the plant.

At the fine end of the plant the ¼-in. by ¾-in. material from the belt conveyor is divided to two parallel sets of screens. Each set consists of two 4-ft. by 12-ft. double deck Symons oscillating screens in series, with ½-in., 5/16-in., ⅜-in. and .206-in. openings and arranged to make three sizes, ¼-in. by ⅜-in., ⅜-in. by ½-in., and ½-in. by ¾-in. and to sluice any sand to the 6-ft. Dorr classifier.

The six gravel storage silos are each 24-ft. in diameter by 60-ft. high (20 ft. below ground and 40 ft. above) and are arranged with feed gates and belt conveyors below for drawing out to the loading bins. Also on one side of each silo a gate and chute permit drawing into railroad cars for stockpiling. Hoppers at the ground line also permit of returning this stockpiled material to the silos when empty.

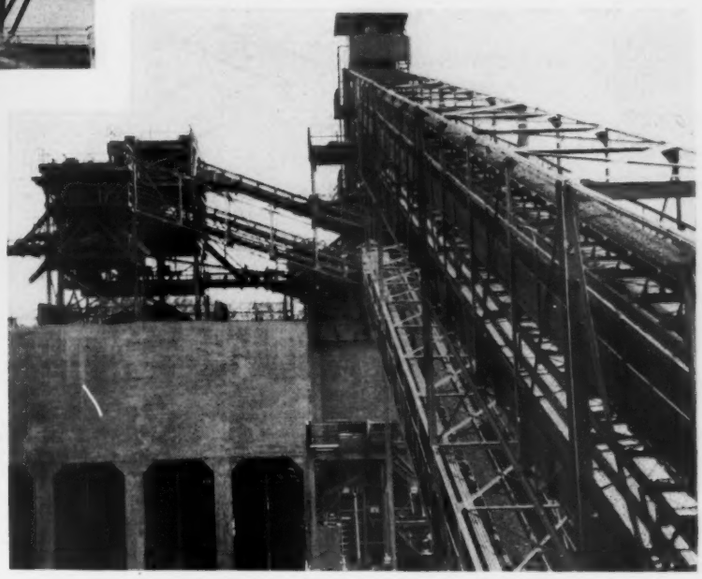
Looking across pit, with conveyor transfer tower in foreground



Left: Bowl washer and classifier for reclaiming fine sand

of the different sizes of gravel is done by regulating these gates.

Below each of the bins is a 4-ft. by 8-ft. single deck Robins "Gyrex" screen with openings of the minimum size of the material in each case. Thus any fines are removed just prior to loading into cars and the material passing over the screens is also washed by means of spray jets.



Right: View of crushed gravel bins and main conveyors from transfer tower

Rock Ladders Used

In the coarse side of the plant the gravel is let down from the screens in to the silos by means of so-called "rock ladders" to eliminate breakage.

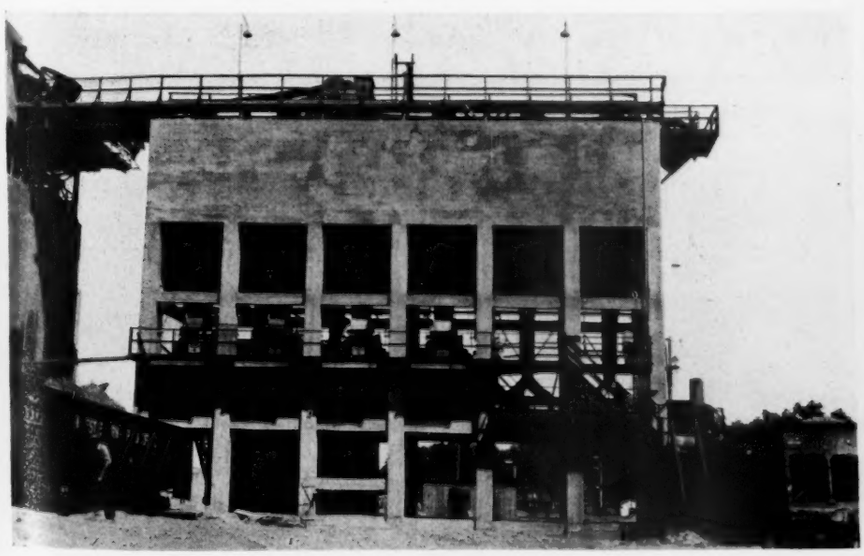
As indicated in one of the photographs, each of these consists of a vertical reinforced concrete pipe in the center of each silo. Each 4-ft. section of pipe has four side openings arranged in a spiral, and at each 4-ft. level a steel baffle plate closes half of the pipe opening. These baffles are on alternate sides so material cannot fall a greater distance than 4 ft. at one time.

Car Loading Arrangements

The gravel is loaded out from a set of six smaller bins which are kept filled by drawing from the main storage silos. These bins are of reinforced concrete construction, rectangular in shape, with hopper bottoms and hold about 3 carloads of material each. They are filled by means of a 30-in. belt conveyor and tripper extending over them and fed in turn by belt conveyors and motor operated feed gates under the silos. The gates and conveyors are controlled by push buttons located on top of the loading bins so that they are kept filled by one man from that point. They carry the same sizes as the silos and function as surge bins between the main silos and the railroad cars.

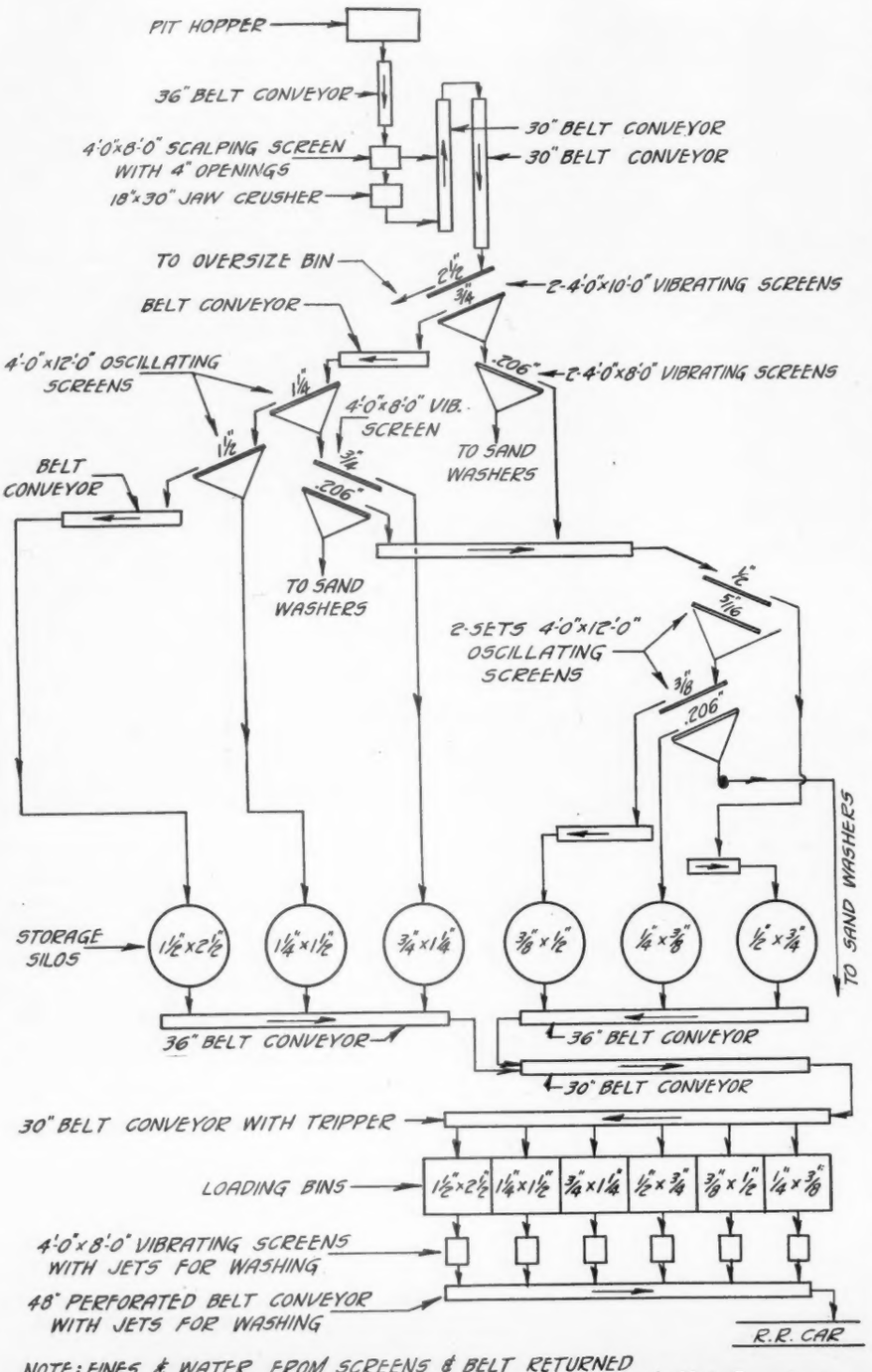
The bottom of each bin is arranged with a rack and pinion operated slide gate with graduations to indicate the amount of gate opening and the blending and proportioning

The different sizes fall from the screens to a belt conveyor where they are combined and carried out to the railroad car. This conveyor is a 48-in. rubber belt with ¼-in. holes to let the water get away and passes under sprays for a final washing of the combined material. A revolving spreader at the discharge end of the conveyor and driven from it helps to prevent segregation during loading.



Loading bins with vibrating screens and perforated belt below

Rock ladder used in silos to reduce breakage



Main flow sheet

The fines and water are collected at the bottom of the plant and put back into the system. Very accurate results as to gradation are claimed with this method of proportioning and combining the sizes.

Sand Equipment

The sand from the various screens flows to a 12-ft. Dorr sand washer and from there is flumed with the addition of fresh water and divided as may be desired between an 8-ft. and a 6-ft. Dorr rake classifier which discharges the sand to two loading bins below.

The overflow from the washer and also the overflow from the classifiers after pumping for primary washing at the first screens, is flumed to a 20-ft. Dorr bowl classifier where the fine sand is separated out and pumped back to the classifiers in such quantities as desired by a 2-in. Wilfley centrifugal pump. Any fine sand not wanted for mixing is spouted directly to a railroad car for storage or shipment.

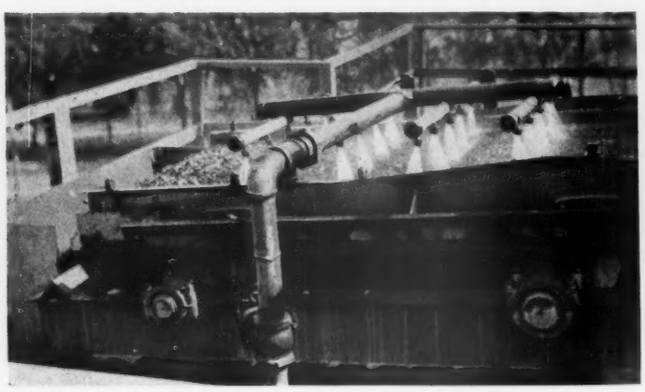
Thus by regulating the amount of fine sand returned to each classifier and by splitting the main stream to these classifiers almost any grading may be obtained and coarse and fine sand produced at the same time. The rake action of the classifiers mixes the fine and coarse sands as they are being dewatered and discharged.

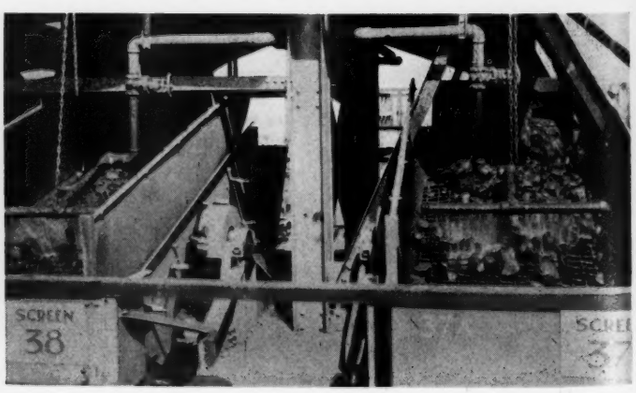
Crushed Gravel

The oversize material (2½-in. by 4-in.) is fed to a 4-ft. Symons cone crusher by a reciprocating plate feeder and belt conveyor and the crushed material discharged either to the main gravel system already described or to another conveyor system and elevated to the crushed gravel plant.

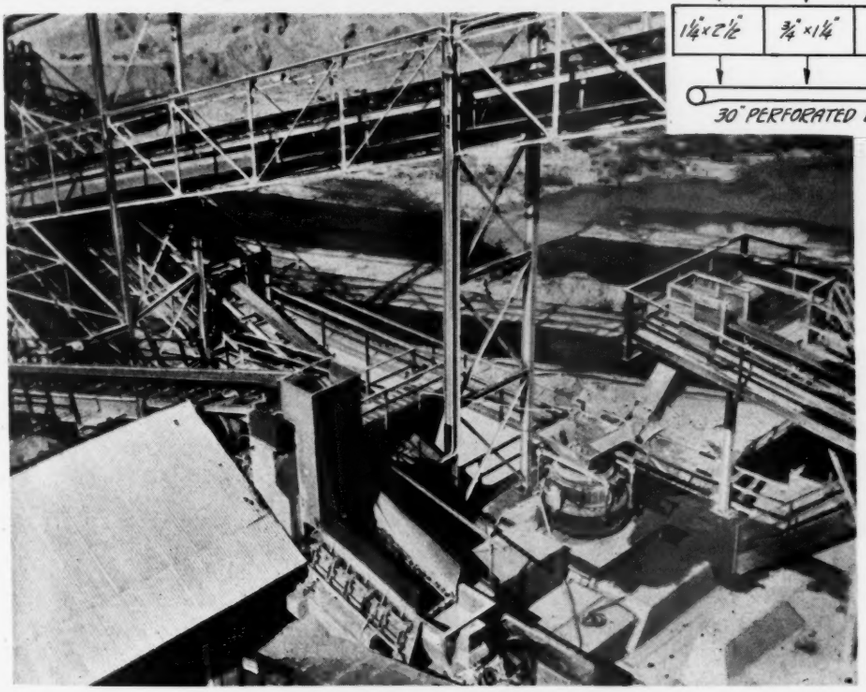
In the latter case it is carried up on a 24-in. belt conveyor below the main gravel conveyor, but in the same gallery, and discharged over a 4-ft. by 8-ft. Symons double deck oscillating screen. This is equipped with 2½-in. openings on the upper deck and 1¼-in. openings on the lower deck. Any oversize is spouted back to the oversize bin for recrushing and the 1¼-in. by 2½-in. size is spouted to one of the four crushed gravel bins below.

Below: Oscillating screens at left and vibrating screens at right

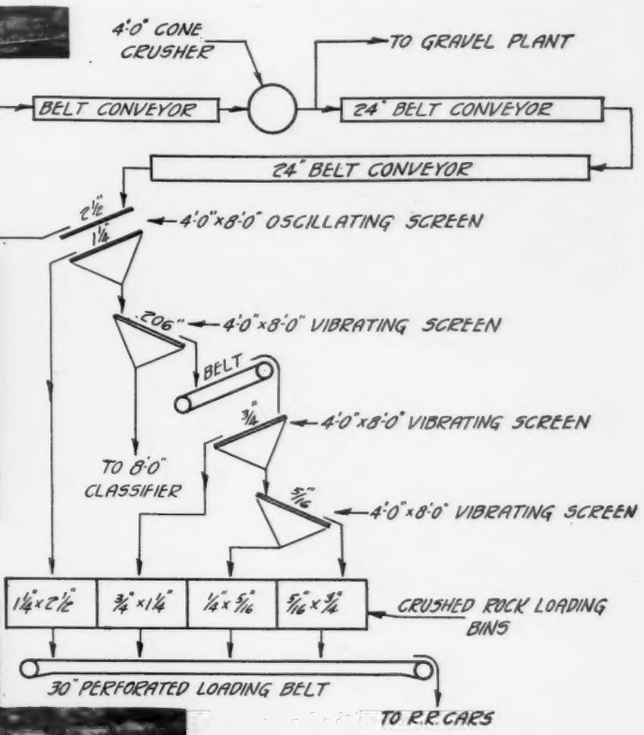




Crushed gravel loading point with perforated belt for washing



Looking down on scalping grizzly and crushers



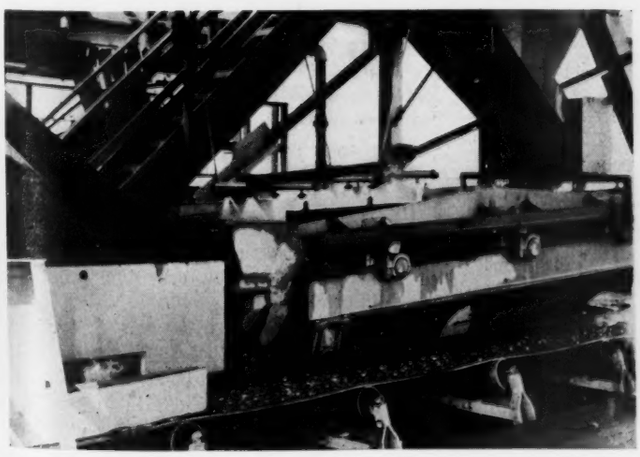
Flow sheet of crushed gravel plant

The minus 1¼-in. product falls to a 4-ft. by 8-ft. Niagara single deck vibrating screen with .206-in. openings where it is dewatered and the fines flumed to the 8-ft. classifier. From this screen the minus 1¼-in. material is carried on a belt conveyor and discharged to the upper of two 4-ft. by 8-ft. single deck Niagara screens in series, with ¾-in. and 5/16-in. openings, where the other three sizes are separated out and spouted to the bins below.

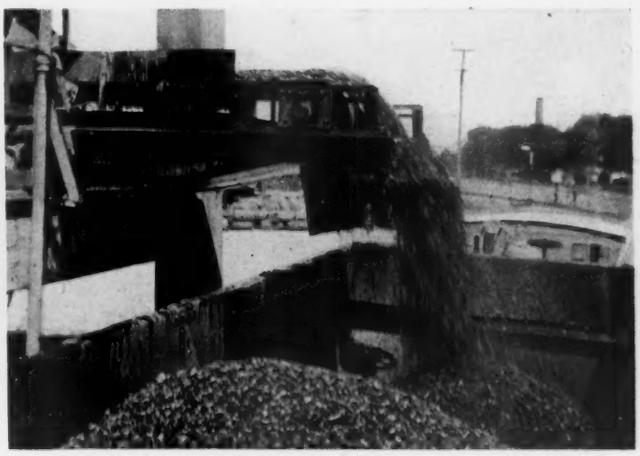
From the bins this material is loaded to railroad cars either segregated or blended by drawing on to a 30-in. perforated loading belt where it is again washed.

General

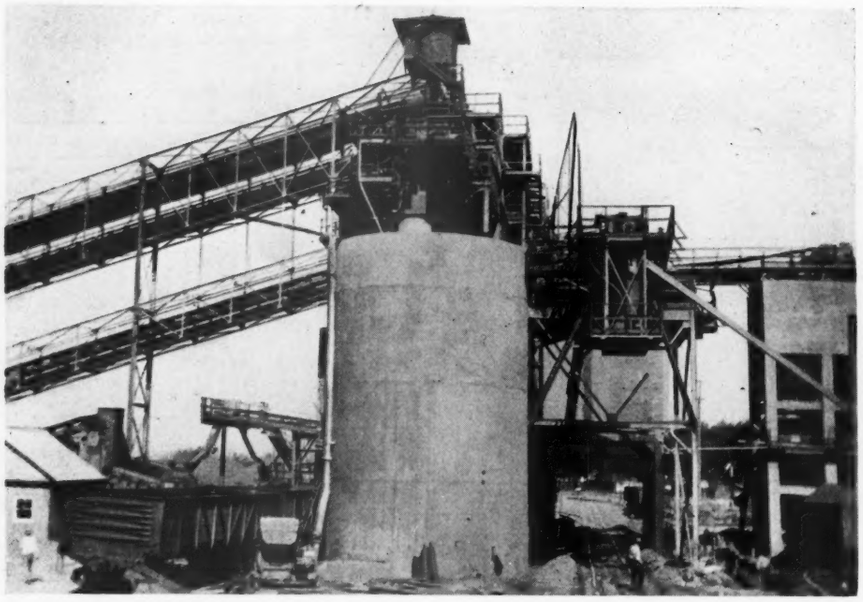
Water for final washing is drawn from an 18-in. well 500 ft. deep by a Bradford 2000 g.p.m. deep-well centrifugal pump



Oscillating screen handling minus 3/4-in. material



Perforated belt and revolving spreader for loading



End view of storage silos with loading bins at right and conveyors at left

direct-connected to a 200-hp. vertical motor made by the U. S. Electrical Manufacturing Co. First washing is done with used water from the classifiers and screens, as already noted. An additional water supply of 1000 g.p.m. is obtained from the settling basin in the overflow pond and the installation of a clarifier is contemplated when the pond fills.

A 30-ton Plymouth gasoline locomotive is used for switching around the plant and an Industrial Brownhoist locomotive crane with Atlas diesel engine for yard storage.

Plant Capacity Can Be Doubled

Most of the conveyor equipment and the feeders were furnished by the Bodinson Manufacturing Co., San Francisco, except that Robins catenary idlers are used on top of the plant and Stearns idlers on the 48-in. loading belt.

Of interest is the provision for practically doubling the plant capacity at minimum expense and with little loss of time, the steel structures having been designed for additional screens and the conveyor frames arranged for 1-ft. wider belts.

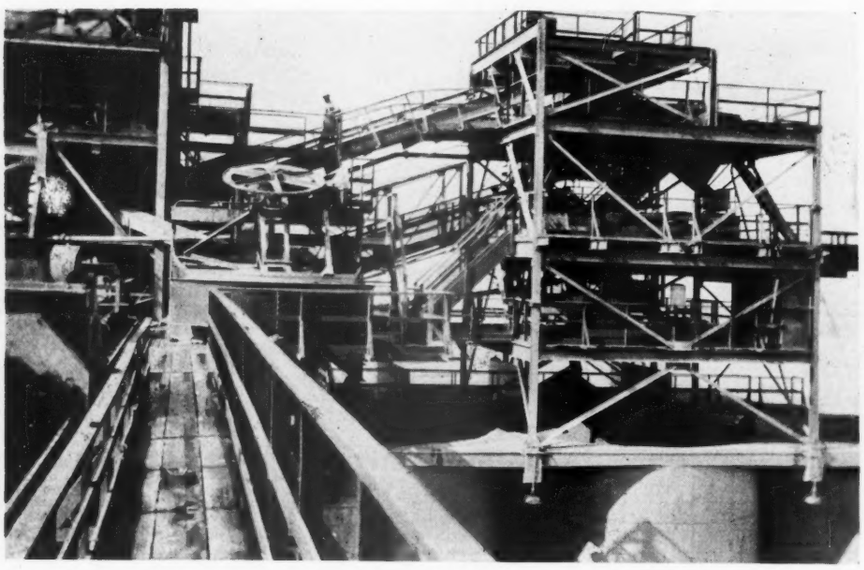
General Notes

The main conveyors have tandem drives with Pacific Gear and Tool Works speed reducers and direct connected motors, which are Sterling, with the exception of one Fairbanks-Morse motor.

The vibrating screens are driven by U. S. motors through Texrope drives, except that Fairbanks-Morse motors are used on the Niagara screens. All motors are of the enclosed weatherproof type.

Conveyor belting was furnished by the Pioneer Rubber Co. with the exception of the two perforated loading belts furnished by the American Rubber Co.

The general offices of the company are at 1522 Latham Square building, Oakland, Calif. Henry J. Kaiser is president and general manager, and Thomas M. Price is production manager.



Fine gravel plant and bowl crusher

United States Leads in Production of Diatomite

DIATOMITE is the name given to the skeleton remains of diatoms, which are microscopic water plants related to the algae and found in all kinds of water. More than 10,000 varieties of diatoms have been studied and classified, varying in shape and design and ranging in size from that of a pin's head to minute particles visible only under a microscope.

These small organisms absorb mineral salts from the water and make skeletons of silica in much the same way that oysters make shells out of lime taken from sea water. They are unicellular and multiply rapidly, but their life span is short. After they die the organic matter decomposes and the skeletons sink to the bottom and form deposits of diatomite, which is a hydrous, amorphous silica. It is estimated that there may be as many as 50,000,000 skeletons in a cu. in. of some diatomite.

Recovery by Mining and Quarrying

The United States leads in the world production of diatomite, with Algeria second. In the United States the most important commercial deposits are in California, with others in Washington, Oregon, Nevada and some of the eastern states.

The deposits are usually mined or quarried and the material is then dried to remove the uncombined water. The raw diatomite is very porous and absorbs considerable water, weighing from 28- to 60-lb. per cu. ft. where as a cubic foot of solid silica weights 131.2 lb. Because of its high porosity and the minute size of its air cells it is a very poor conductor of heat.

The chief uses of diatomite are: First, as a filtration medium; second, as a heat insulation material; and third, as an admixture in concrete. It is also used as a filler material in various manufacturing processes and for polishing.

It is marketed either as a powder or as brick. Sawed or pressed brick are made, either natural or calcined, for insulating purposes. The pulverized product is prepared by crushing, screening and air classifying.

The above and much more information on diatomite, including production statistics, lists of producers and buyers, prices, etc., is contained in Information Circular 6391 recently published by the U. S. Bureau of Mines, Washington, D. C.

Ohio Citizens Obtain Concrete Road Specification

ANNOUNCEMENT was made July 24 at the office of Governor George White and Director of State Highways O. W. Merrill, that the plans for the five-mile improvement on the Ohio river road, extending from the Scioto county line toward Ironton, would be changed and the road readvertised.

The specifications originally provided for widening the road to 20 ft., placing a 12-in. concrete "header" on either side and resurfacing the present macadam base with brick. Advertisements for this type of improvement were published and bids on the work were to have been opened July 28.

Recently a delegation composed of city officials and representative business men held a conference with the governor and highway directors and petitioned them to change pavement from brick to concrete.

City Manager Howell presented the petition of the delegation for resurfacing of the road with concrete instead of brick, calling the attention of the governor to the fact that concrete was as cheap if not cheaper; that unemployment was great in Ironton and Lawrence county and that the county had two cement plants furnishing work to a large number of men. Mr. Howell said in view of the fact that the road was to be built entirely in Lawrence county that the county representatives felt no hesitancy in requesting that it be of concrete type, not only that the county's paving material might be used at its own doorstep instead of material from some other county but that the cement plants might continue to operate and furnish employment. His presentation of the facts resulted in state officials issuing an order to reject all bids July 28 and to readvertise the work. The new specifications will provide for surfacing the road with brick as originally intended or with concrete. Proposals will be received both ways and the work awarded to the lowest and best bidder.—*Ironton* (Ohio) *Tribune.*

Colorado Mayor States Policy on Cement Purchases

CITY OFFICIALS of Denver, Colo., will not recede from their stand of throwing paving work open to competition among cement manufacturers.

Protest against the new policy was lodged July 27 by officials of a Colorado cement company. City officials replied that the charter intended there should be competition, although Colorado products are given a 5% advantage in price.

Under the former city administration, contractors were notified that only Colorado cement should be used in street and alley paving. As there is only one concern making cement in Colorado it had a monopoly on the business.

Recently a California company operating a plant at Laramie, Wyo., sought the business. Mayor Begole and Walter B. Lowry, manager of improvements, decided to use the Wyoming cement if the price differential is met.

Manager Lowry said on all calls for bids for paving, contractors will be asked to submit prices for the work with and without the cement. Because of reports of secret price cutting by cement manufacturers, it may be necessary for the city to buy its own cement and furnish the contractors, he said. —*Denver* (Colo.) *News.*

San Jose Cement to Start Construction Soon

CONSTRUCTION of the proposed $2,250,000 plant of the San Jose Cement Co., Ltd., was to be started July 30 by the company's engineers, according to an announcement made by executives. The site will be surveyed immediately, it is stated, and actual building operations will begin in approximately 90 days.

Officials emphasized the fact that the plant will be one of the most modern cement plants in California, embodying all recent developments designed to eliminate completely any detrimental results incidental to cement manufacture.

Vincent Gerdau, secretary of the San Jose Cement Co., Ltd., said:

"Processes to be used in the making of our high-early-strength super cement are so modern that they overcome any of the objections usually associated with plants manufacturing this commodity."—*San Francisco* (Calif.) *Call-Bulletin.*

Kansas Producer Makes Improvements

IMPROVEMENTS costing $60,000 now are being made at the reorganized Victory Sand and Stone Co. plant at Topeka, Kan. When completed, the plant will be one of the best equipped in Kansas.

Construction of conveyors, sand and gravel bins, stock piles, and a railroad siding now is under way. The first unit of the plant should be in operation soon, M. M. Small, secretary and manager of the Victory Sand and Stone Co., said recently.

Improvements also include a gravel boat and digger which cost $50,000.

"When improvements are complete," Mr. Small said, "we will be in a position to meet any specifications for any purpose. All material will be washed and graded to meet the state or commercial specifications. Under average conditions of pumping, the Victory plant could pump approximately 20 carloads of material a day," Mr. Small said.

The Johnston sand plant, leased by Victory, has been operated by William A. Johnston for the past five years.—*Topeka* (Kan.) *Capital.*

Mayor Closes Bell Cement Plant Fight

REPEAL of two ordinances granting Alphonzo Bell permits to erect a cement plant in the Santa Monica mountains of California was completed as the result of Mayor Porter's approval of measures recently passed by the Los Angeles city council.

Mayor Porter, who also signed the original ordinances granting Bell special zoning permits to allow the construction of the cement mill, today declared that "conditions have changed," and that he felt his reversal of position was justified.

Controversy over the Bell cement plant scheme started some two years ago when application for the zoning permits was made before the city planning commission. Later the city council voted 10 to 5 in favor of the application.

Circulation of referendum petitions against the zoning ordinances, however, held up the establishment of the rock crusher until last May, when the State Supreme Court, in effect, held that the petitions contained sufficient signatures to require a vote.

As a result, the former council ordered a referendum proposition against the so-called Bell ordinance placed on the next general election ballot, June, 1933, but, following the installation of the new council on July 1, steps were taken to secure immediate repeal of the permits.—Los Angeles (Calif.) *Express.*

Zircon Found in Zirconium Sands

FROM A SCIENTIFIC point of view, the zircon is by far the most remarkable of the gem stones, and a satisfactory solution of the problems offered by its characters and constitution has not yet been made.

Actual production of the gem zircon in the United States does not exist, although as zirconium increases in importance and domestic sources of the element are sought, gem crystals of zircon in commercial quantities may be discovered at any time.

It is possible, of course, to find the gem material wherever crystals of zirconium silicate are found, and beautiful stones have been observed in a number of localities in the United States, notably in Colorado, New York, New Jersey, Maine, North Carolina, South Carolina and Idaho. None of these states, however, have been mentioned as sources of zircons. Evidently Ceylon is the present-day commercial source of most of the colorless zircons on the market and Siam of the blue stones.

For rough stones, the local price in Siam is approximately $3.75 to $22.50 a lb., according to the quantity sold; the range for the cut stones is from 90c to $1.80 a carat.

This, and more detailed information, is contained in Information Circular 6465 of the U. S. Bureau of Mines.

Hiring Extra Help Is Novel Economy Measure

By This Method Gordon Sand and Gravel Co., Denver, Colorado, Reduced Operating Costs 15%

By Lucius S. Flint

THE BUSINESS DEPRESSION has forced the sand and gravel man to face two important problems: First, how to produce a commodity of such outstanding quality that he need not worry about losing his customers to competitors, either because of lower prices or better merchandise; and second, how to turn out such a product at a price that enables him, not only to hold his own but to widen the margin of profit sufficiently to absorb to some extent, losses resulting from a general falling off in trade.

The Gordon Sand and Gravel Co., Denver, Colo., recently took steps in this direction—with excellent results. In the first place the quality of the concrete sand was improved by eliminating some of the fines, this being done by placing an additional screen between the main revolving screen and the storage bin.

Besides greatly improving the quality of the concrete sand this change made available another product, known as engine sand and sold for mine and locomotive use. Approximately 40 yd. of this product is now turned out daily, with an investment of not over $100 for the additional screen. Approximately 135 cu. yd. of concrete sand are turned out daily.

Pea Gravel Loss Eliminated

Installation of a specially constructed pea gravel washer has also made possible the recovery of what was formerly a discarded by-product. Sticks and dirt made the pea gravel unfit for use without washing. The washer was constructed by the company's own men at very little expense and is operated at a cost of $5 per day. As approximately 25 cu. yd. of this gravel are produced daily, selling at 75 c. per cu. yd., this recovery represents a worth while saving. The washer consists of a large wheel on which are mounted a series of cups and on which a stream of water is played.

Substitution of bolts for nails on the braces supporting the hoist mast has also resulted in an appreciable saving. Before this change was made the braces loosened every few months, necessitating a costly shut-down for repairs. Since heavy bolts were substituted the vibration has not affected the stability of the mast.

"These changes are small individually, but collectively they go far in enabling us to hold down expenses and produce a better grade product," G. W. Jennings, office manager, declared.

Extra Help Proves Profitable

Contrary to general practice during the present period the company has employed more instead of less men, two men now handling the work formerly done by one. As now arranged one man handles the machinery and another supervises the plant. It was found that the losses resulting from oversights on the part of the one man amounted to more than the saving on labor.

In pointing out the reasons for the change the plant manager said: "Having handled the sand plant for some time before an extra man was put on to take care of the machinery I know that it is impossible for a single person to give sufficient attention to both phases of the work. While the machines are being taken care of the bin opening or the screens are likely to become clogged with the result that a run of poor grade sand is produced and sometimes a temporary shut-down is necessary. These are only a few of the things which are bound to be neglected if too small a number of men are employed."

According to the management, production costs have been reduced approximately 15% by giving closer attention to these details.

Closer supervision of truck operation has also resulted in sizeable savings for the Gordon company. A daily operation report is turned in by every driver concerning his truck. This report shows the amount of work done, the amount of fuel and oil used and the number of repairs made. All repair work is done at the Gordon garage.

N. S. G. A. Conversion Chart for Coarse Aggregates

By Edmund Shaw

Contributing Editor, Rock Products

IN THE May 9 issue of Rock Products there was published an article by the writer in which there was shown charts for converting sieve tests, or mechanical analyses, of aggregates made with one set of sieves to the results that would be found by another set of sieves. It is evident that other engineers beside those mentioned in the article have found it necessary to use a chart of this kind. Stanton Walker, director of engineering and research of the National Sand and Gravel Association, has sent me copies of a chart of this kind which the association has printed for the benefit of its members. It is issued in thin paper of note book size with red lines so that blue prints may be made from plottings upon it.

This chart is only for coarse aggregates and gives only the square screens and round screens in use. Since it is of the proportional and not the logarithmic type, the lines for the screens finer than No. 4 would have had to be crowded into a ¾-in. space if they had been drawn. And if the spaces were in exact proportion the lines at the right would have been so close that plotting would have been difficult if not impossible. This is a well recognized difficulty with this form of graph and the only way to overcome it is to make the chart very large. Jean H. Knox, Dallas, Tex., has sent me some curves drawn on a chart of this kind. The coarsest screen shown is 2-in., but the chart has to be 15½-in. long to plot the 100- to 200-mesh size so that it can be read.

This is not said in the way of criticism. The writer knows and appreciates that there are so many standard grading curves made on this type of graph that its use can hardly be discontinued. For coarse aggregates it is as convenient as any and the straight line gradation may be plotted upon it for comparison. Mr. Walker was quite right in preferring it for the conversion of round to square hole sieves. But for fine aggregates the writer would like to see the logarithmic graph used in all cases. The exception to this would be the graph on which percentages remaining on *each* sieve are shown.

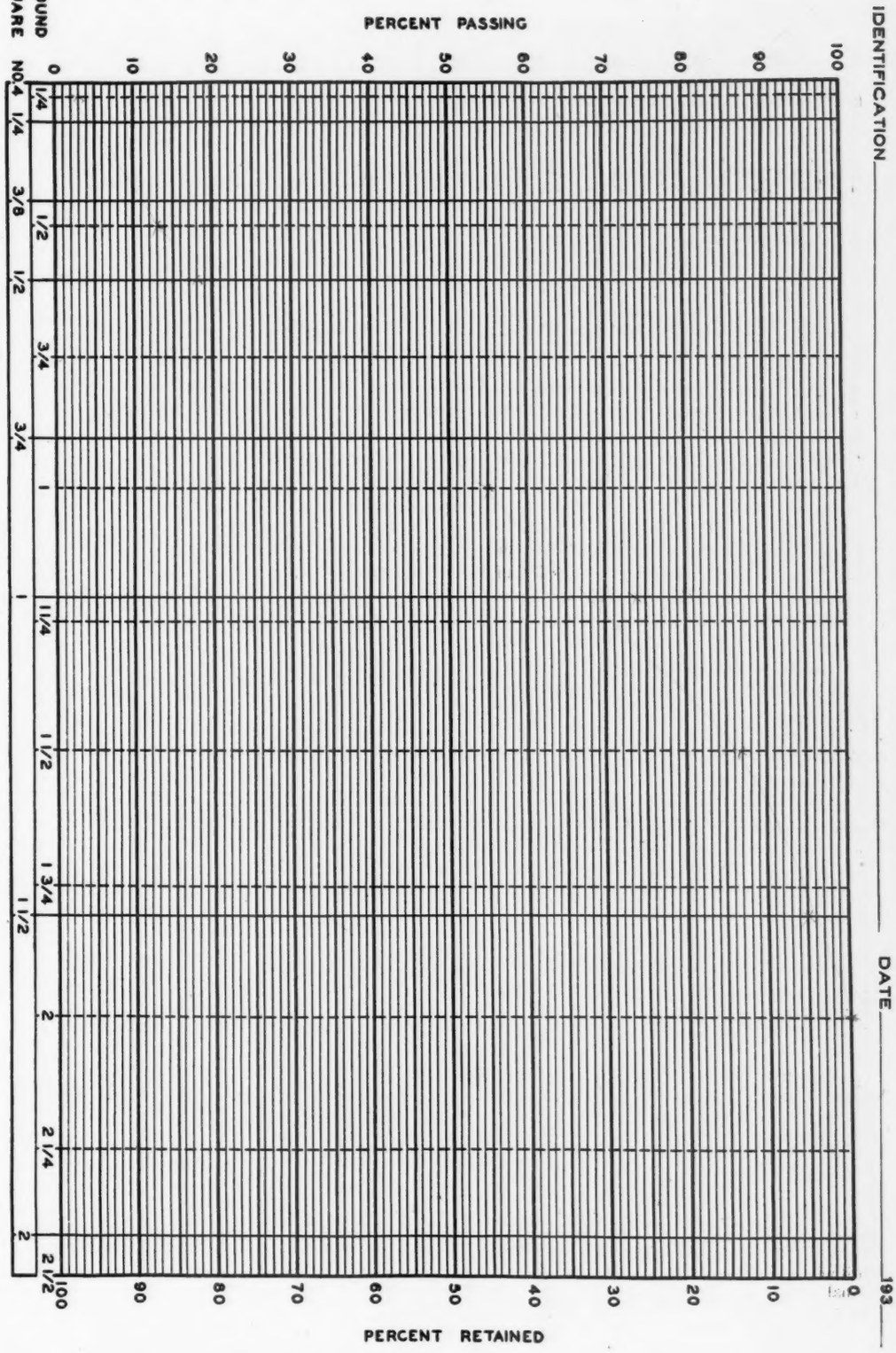
Mr. Walker writes concerning the matter of one series of sieves, all with square openings, for testing aggregates:

"The three mineral aggregate associations have all gone on record in favor of the use of square openings for tests of coarse aggregates. I think there is a fair possibility that the A.S.T.M. may go to square openings instead of straddling the fence and using both as they have in the past. The Federal Specification Board's specifications are all coming out in favor of square openings and I think we can say that there is a definite trend toward standardization in this respect. . . . I feel confident that considerable headway is being made in the adoption of the same sieves from the A.S.T.M. (U.S. Standard) series. One of the stumbling blocks, it seems to me, is the importance that is attached by most highway engineers to the specification limit on the No. 20 sieve."

NATIONAL SAND AND GRAVEL ASSOCIATION, INC.
WASHINGTON, D. C.

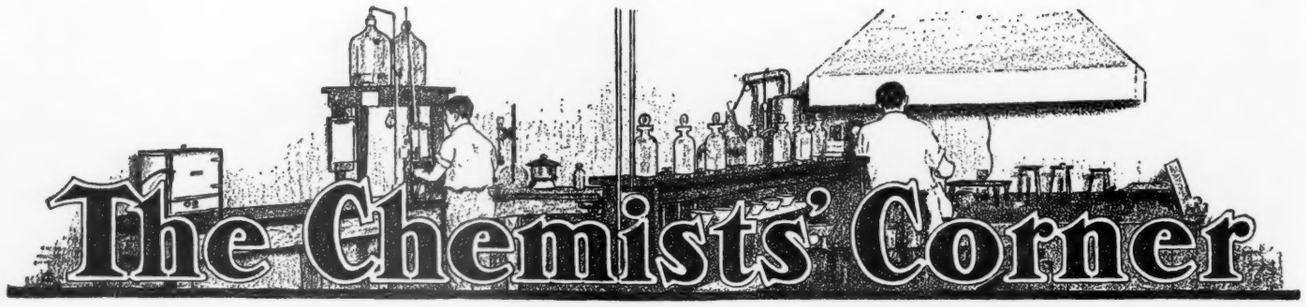
MECHANICAL ANALYSIS OF COARSE AGGREGATE

IDENTIFICATION _____ DATE _____ 193



PER CENT PASSING											
OPENING	¼" (# 4)	⅜"	½"	¾"	1"	1¼"	1½"	1¾"	2"	2¼"	2½"
ROUND											
SQUARE											
ROUND											
SQUARE											
PER CENT RETAINED											
ROUND											
SQUARE											

Chart for recording sieve analysis of coarse aggregates and for conversion from one set of sieves to another, as used by the National Sand and Gravel Association



Storage of Portland Cement

Its Effect Upon Fineness, Setting and Strength Properties

By Alton J. Blank

General Superintendent and Supervising Chemist, Compania de Cemento Portland "Landa," S. A., Puebla, Puebla, Mexico

IN ONE of the several discussions entered into between Katsuzo Koyanagi and the writer, particularly the paper by the writer, "Analysis of the Article by Katsuzo Koyanagi—Accounting for Ignition Loss in Analysis of Clinker" in the "Chemist's Corner" of the October 25, 1930, issue of Rock Products, the writer stated that he had "never found the strength qualities of portland cement to be bettered upon prolonged storage once ignition losses had been increased through the absorption of atmospheric carbon dioxide and moisture," and furnished data covering the testing of four samples of cement. The average ignition loss of the fresh cement was 0.88%, the average ignition loss of the cement after three weeks storage was 1.34%, or 0.46% higher. It was shown that the fresh cements yielded 18% higher tensile strengths and 13% higher compressive strengths than those cements which were tested after three weeks storage. These tests were performed by the writer upon a standard portland cement some time past when it was necessary to know the effect of storage upon the cement under study at that time.

Since that time, and of more recent date, the writer has conducted a series of tests upon another typical portland cement, as samples of the cement tested theretofore were not available. In the latter series of tests the results obtained were somewhat different from those obtained in the former tests, and since the writer is a believer in fact rather than theory, these latter findings are given herewith.

Over a period of several months, 18 daily average samples of cement taken direct from the mills, each of which composed 24 hourly samples combined to form an average, were tested as to fineness, setting time and tensile strength after each sample had been stored in cloth bags in the laboratory for periods of 24 hours, 14 days, one month, two months and three months respectively. Inasmuch as the chemical composition of the 18 samples of cement were more or less uniform, a typical analysis of the cements only, is given:—

SiO_2	21.96%
Al_2O_3	6.34
Fe_2O_3	2.38
CaO	62.76
MgO	3.26
SO_3	1.97
Ign. loss	1.12

The fineness, setting time and tensile strength of each of the 18 samples of cement after various periods of storage are shown herewith. Briquets for strength tests were tested at ages of 24 hours, 3 days, 7 days, 28 days and 3 months.

The test data indicate that the fineness of the cement, as a rule, increases somewhat after having been stored for three months.

Setting times of the cement, both initial and final, are found to be retarded somewhat in the majority of samples tested, although several samples were found to have had their setting times accelerated.

Roughly judged, cements Nos. 1 to 9 inclusive show increased strengths up to storage periods of one month, decreasing thereafter.

Cements No. 10 to and including cement No. 16 show increased strengths up to storage periods of 14 days, while cements Nos.

CEMENT SAMPLE No. 1

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	95.6	95.5	95.9	96.1	96.7
Initial set, in min.	90	95	90	98	103
Final set, in min.	220	220	232	239	250
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	129	150	187	153	121
3 days	269	293	388	284	268
7 days	347	423	474	339	333
28 days	399	458	498	403	374
3 months	411	493	534	427	399

CEMENT SAMPLE No. 2

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	94.5	94.7	95.0	95.3	95.2
Initial set, in min.	100	97	104	100	112
Final set, in min.	230	235	227	225	245
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	127	173	202	139	133
3 days	260	313	361	289	248
7 days	357	432	437	405	334
28 days	404	477	491	443	381
3 months	462	496	506	488	424

CEMENT SAMPLE No. 3

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	96.2	95.4	96.8	97.4	97.7
Initial set, in min.	105	105	109	105	105
Final set, in min.	225	234	227	239	240
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	172	277	242	183	161
3 days	252	315	412	332	244
7 days	331	346	443	383	328
28 days	399	445	470	472	384
3 months	417	463	537	504	411

CEMENT SAMPLE No. 4

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	94.6	95.1	95.3	96.4	96.2
Initial set, in min.	85	93	90	95	99
Final set, in min.	210	222	220	220	229
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	163	266	233	156	136
3 days	249	339	344	306	229
7 days	300	405	408	364	302
28 days	403	462	498	410	409
3 months	464	501	571	489	477

CEMENT SAMPLE No. 5

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	91.6	92.4	92.0	93.7	93.7
Initial set, in min.	100	100	109	115	110
Final set, in min.	230	235	235	251	240
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	181	187	165	147	132
3 days	315	324	311	309	280
7 days	386	410	353	339	323
28 days	441	485	441	424	416
3 months	465	518	496	494	444

CEMENT SAMPLE No. 6

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	94.1	95.1	94.6	95.9	96.2
Initial set, in min.	85	85	92	100	100
Final set, in min.	210	215	227	225	231
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	240	209	188	159	126
3 days	399	397	374	355	317
7 days	441	489	422	379	362
28 days	470	520	456	423	401
3 months	506	561	494	477	449

CEMENT SAMPLE No. 7

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	96.6	97.2	96.9	97.7	98.3
Initial set, in min.	100	105	100	116	109
Final set, in min.	220	220	240	235	238
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	264	218	196	189	156
3 days	372	342	339	332	313
7 days	444	489	434	376	348
28 days	470	496	454	425	408
3 months	513	547	507	492	471

CEMENT SAMPLE No. 8

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	93.4	94.9	94.5	95.3	95.7
Initial set, in min.	85	99	95	102	100
Final set, in min.	210	210	225	220	220
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	158	152	145	146	124
3 days	295	332	298	295	269
7 days	337	390	375	353	328
28 days	419	489	477	462	417
3 months	473	540	501	484	460

CEMENT SAMPLE No. 9

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	95.6	96.4	95.8	97.9	97.7
Initial set, in min.	95	102	98	110	105
Final set, in min.	235	245	238	238	247
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	152	154	168	151	128
3 days	300	342	344	308	280
7 days	379	396	372	372	337
28 days	414	463	516	489	421
3 months	502	527	526	509	447

CEMENT SAMPLE No. 10

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	93.8	93.8	93.6	94.4	94.7
Initial set, in min.	70	77	72	84	80
Final set, in min.	230	232	230	235	235
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	183	178	167	150	121
3 days	344	339	322	297	293
7 days	397	412	384	377	353
28 days	458	472	441	436	392
3 months	520	551	492	480	474

CEMENT SAMPLE No. 11

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	95.4	95.1	95.5	95.7	95.4
Initial set, in min.	90	85	85	90	90
Final set, in min.	230	230	245	238	232
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	178	181	138	128	106
3 days	344	366	304	304	300
7 days	412	394	382	378	357
28 days	436	443	427	419	401
3 months	497	517	478	461	445

CEMENT SAMPLE No. 12

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	94.2	94.0	93.7	94.1	94.1
Initial set, in min.	95	98	95	102	95
Final set, in min.	225	220	232	225	225
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	181	207	202	180	153
3 days	335	365	350	342	320
7 days	405	409	397	378	366
28 days	480	494	476	424	400
3 months	514	563	501	481	449

CEMENT SAMPLE No. 13

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	95.6	95.9	95.7	95.7	96.3
Initial set, in min.	90	97	97	100	93
Final set, in min.	230	238	235	235	235
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	165	167	156	152	121
3 days	326	339	311	273	260
7 days	372	381	360	359	324
28 days	416	456	417	370	354
3 months	509	571	494	445	406

CEMENT SAMPLE No. 14

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	95.0	95.0	95.4	95.1	95.4
Initial set, in min.	80	93	85	85	97
Final set, in min.	190	200	197	192	198
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	172	181	167	161	125
3 days	293	324	332	289	264
7 days	397	437	398	374	360
28 days	470	462	444	427	417
3 months	563	569	535	476	454

CEMENT SAMPLE No. 15

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	92.2	92.0	91.6	92.0	91.9
Initial set, in min.	90	90	69	80	82
Final set, in min.	215	222	207	215	219
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	218	228	178	154	108
3 days	355	356	326	319	301
7 days	381	394	364	352	337
28 days	467	498	445	440	429
3 months	501	569	488	465	442

CEMENT SAMPLE No. 16

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	95.6	95.1	96.8	95.8	96.1
Initial set, in min.	95	101	95	95	103
Final set, in min.	215	220	218	233	241
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	162	168	154	143	142
3 days	330	344	324	301	294
7 days	379	432	372	359	332
28 days	414	464	410	388	381
3 months	472	546	469	466	447

CEMENT SAMPLE No. 17

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	93.8	92.9	93.4	93.5	94.1
Initial set, in min.	110	111	97	80	80
Final set, in min.	240	240	215	210	202
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	196	194	163	156	121
3 days	324	337	289	301	284
7 days	419	403	369	354	347
28 days	474	468	464	465	423
3 months	610	507	493	477	461

CEMENT SAMPLE No. 18

	Period of storage in cloth bag in laboratory				
	24 hours	14 days	1 month	2 months	3 months
Fineness through 200 mesh..	90.6	89.9	90.1	90.0	90.9
Initial set, in min.	90	84	77	69	65
Final set, in min.	210	210	202	209	208
Tensile strength—1:3 sands in lb. per sq. in.					
Age at test					
24 hours	192	207	185	157	141
3 days	361	350	324	306	304
7 days	402	397	386	369	352
28 days	497	499	472	464	394
3 months	575	531	499	491	470

17 and 18 show decreases in strengths after storage periods of 24 hrs.

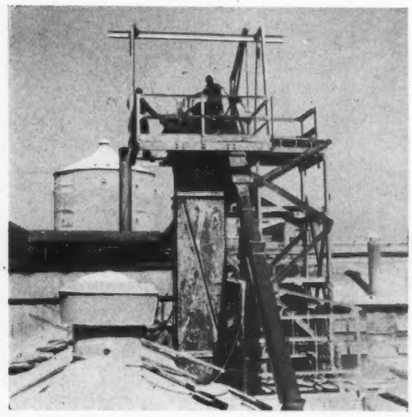
No conclusions have been formed by the writer as to the reasons for the increases in strengths and decreases in strengths of the cements tested since no attention was paid to the fineness of grinding of the raw mixtures, the degree of hardness to which the clinkers were burnt, nor to the length of time the clinker was stored before grinding.

From perusal of results obtained it is suggested that some chemical reactions between the various ingredients of the cement took place during their respective storage periods, which our fellow writer, Mr. Koyanagi, could no doubt explain.

Changes at Bellefonte, Penn., Plant of the American Lime and Stone Co.

A NUMBER OF CHANGES have been made at the Bellefonte, Penn., plant of the American Lime and Stone Co., according to a recent issue of the *Warner-American News.*

According to the *News,* the most important of these was the construction of a new hydrate building and changes to the hydrate plant which are expected to materially increase the production capacity and improve the fineness of the product.



Construction view of elevator extension

The new structure, which was built around the old plant without interfering with operations, is of steel construction and has a total height of 100 ft. The steel frame was covered with metal lath which in turn was covered with gunite, using cement and minus 10-mesh limestone produced at the plant.

In making the machinery changes the latest types of bearings, power transmission and lubrication methods were used throughout.

Of at least equal importance was the installation of a Northern Blower Co. dust collecting system to take care of the dust from the plant, which had been somewhat of a nuisance. This system was put into operation in April and a remarkable improvement in atmospheric conditions is stated to have resulted.

Because of the demand for special sizes of pebble lime, the lime elevator was lengthened so that an additional screen could be installed.

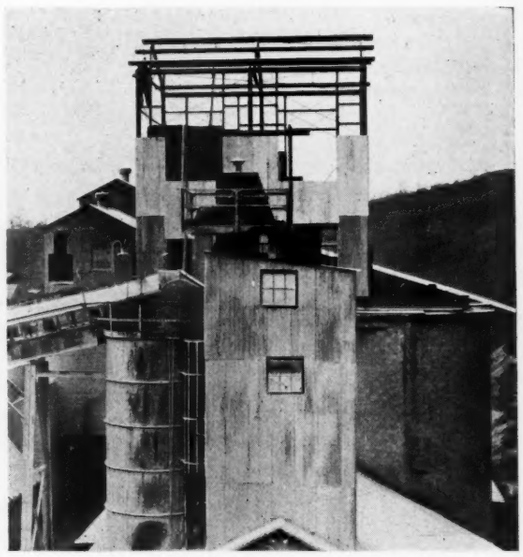
Another change along the lines of greater efficiency was that made in the arrangements for the preliminary drying of the stone. Previously this was done by using part of the waste heat from the No. 1 kiln, this being piped from the kiln to the stone dryer.

However, at times when No. 1 kiln was shut down, it had been necessary to use additional heat in the way of purchased gas to do this drying for No. 2 kiln. Hence the waste heat piping was changed and a connection made with No. 2 kiln so that now, no matter which kiln is operating, heat is always available for the drying.

These changes are all along the same general lines as changes made in the company's mining operations two or three years ago. At that time the problem of gaining a larger stone production was carefully studied and the various operations analyzed.

From these studies it became apparent that a considerable improvement could be made in the operations of chute drawing, haulage, dumping and sledging through the grizzly. Hence, these operations were changed along the lines indicated and more tonnage was handled with less expense and without opening up new mining levels.

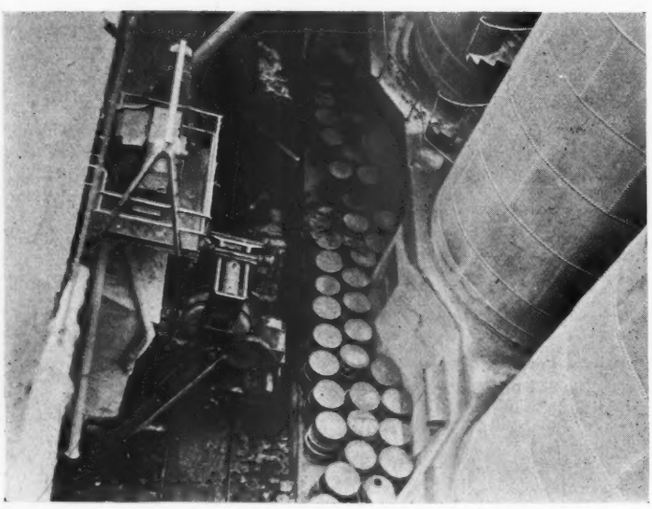
By using modern cars in the mine it was found that the same number of larger cars equipped with Timken roller bearing wheels could be hauled by the same locomotives. Also by revamping the dumping points and installing a simple device to dump the cars as they passed, this part of the operation was speeded up and made easier. Thus an increased tonnage was handled without having to buy any additional locomotives.



Construction view of dust collecting installation

The cost of these improvements was considerably less than would have been required to extend the shaft and open up a new level.

Both the mining operations and the lime plant were described in the June 3 and June 17, 1922, issues of Rock Products.



A concrete mixer mounted on a flat car was used to mix concrete for the building foundations

New Concrete Admixture

THE Pumicite Co., St. Louis, Mo., is marketing a new material, "Volco-Ash," for use as a concrete admixture. Volco-Ash is the basic material from which Pumicite is refined. Approximately 90% is said to pass a 200-mesh screen when dry. The moisture content varies from 2 to 7%.

In using Volco-Ash the amount is said to be contingent upon the quality of cement, gradation of aggregate, and the type of reinforcing. Under any condition a minimum of 15 lb. per cu. yd. is recommended.

The bulk price of Volco-Ash in carloads is $4.00 per ton f.o.b. cars at Fowler, Kan.

Oregon Cancels Waivers on River Sand and Gravel Royalties

ACCORDING to statements by the Oregon State Land Board, which has charge of river-bed leases in the state, 49,015 cu. yd. of gravel and 180 cu. yd. of sand were taken from the Willamette river during the first 6 months of 1931; and 161 cu. yd. of gravel and 131 cu. yd. of sand from the Umpqua for the same period. The rate of royalty paid by operators under state leases is 10 c. per cu. yd. for both gravel and sand.

Sand producers on the Columbia river, between Astoria and Umatilla, operate under joint permits from Oregon and Washington. A royalty of 5 c. per cu. yd. is collected by a joint state agency and the proceeds are equally divided between the two states.

All waivers for payment of royalties for sand and gravel taken from the streams of the state have been canceled, due to depletion of the irreducible school fund and the consequent need for all funds that may be made available, according to announcement coming from the board recently.

These waivers have applied to sand and gravel used in highway construction whether applied on state or county roads, and according to statement of officials, resulted in the loss of thousands of dollars of revenue to the common school fund. Because of depletion this year the annual apportionment of interest money to the schools this year was 10 c. per capita less than that of a year ago. Consequently contractors bidding on highway work hereafter must include this royalty charge of 10 c. a yd. in the bid.

Producer Makes Operation a Recreation Center

A PARK with a lake of several hundred acres is taking form in the bottom lands between the Scioto river and S. High street in Columbus, Ohio.

This is the area owned by the American Aggregates Co., sand and gravel operators.

A hydroplane airdrome will be built on the lake, if present plans materialize.

Plans for the park are being worked out by the American Aggregates Co. as rapidly as its excavation work permits, M. G. Kerr, district manager, said recently.

Whether the park will be offered for sale to the city or be operated as a private park is to be decided later, Mr. Kerr said.

Speed boating and fishing will be other attractions. Cottages could be erected on an island one-half mile long in the center of the lake.

The American Aggregates Co. has successfully completed a similar project on its land in Indianapolis.

An 18-hole iron play golf course, "Elmcrest," has been built on the company's land here.—*Columbus* (Ohio) *Citizen.*

Name Receiver for Ohio Gravel Producer

CARL CONRAD was named receiver for the Dayton Gravel and Sand Co., Dayton, Ohio, in an entry signed July 25.

Suit for the appointment of a receiver was filed by Harry E. Riddleberger. In the petition it is claimed that the company was solvent in June, 1930, but since the first of the year, however, it is claimed in the petition business has shown a decrease because of lack of building in Dayton and that on August 11, a note for $2,750 was to fall due. This, the company would not be able to pay, it is asserted.

Other firms which the gravel company owes have threatened suit, the petition avers and the appointment of a receiver to conserve the assets was asked.—*Dayton* (Ohio) *News.*

Gravel Injunction Case Is Dissolved

ALTHOUGH a restraining order against the county's purchasing gravel from the Southwestern Gravel Co. for $1.95 a ton was dissolved by W. G. Long, district judge, the county will not issue a work order on projects where the gravel will be used until determination of a civil suit against the contract, J. Floyd Frazier, county engineer, said recently.

Two suits were filed by W. F. Smith, taxpayer, in behalf of himself and others. One charged the former county commissioners let the contract to the Southwestern company at a price higher than the $1.79 bid by the Concho Sand and Gravel Co. The other suit was the restraining order to prevent carrying out the contract until the first suit could be determined.

In dissolving the injunction, Judge Long said he was doing so without prejudice in the event another district judge would issue an order. However, with the county commissioners and engineer taking the attitude of waiting until the district court suit is decided, it is improbable another restraining order will be requested.—*Oklahoma City* (Okla.) *News.*

Gravel Company Sues to Establish Rights

FOLLOWING the decision of the Iowa Supreme Court, a new suit has been filed in the district court by the Missouri Gravel Co., Moline, Ill., against McDougal Construction Co., et al. This is an action to establish the claim of the plaintiff and to adjudicate the right to retained percentages on the contract and to enforce liability on contractor's bond for material furnished.

Plaintiff alleges to have furnished material in the amount of $11,453.01 and asks that the court make disposition of the retained percentages amounting to over $2,000.—*Keokuk* (Ia.) *Gate City.*

Night Shift Is Added After Improvements at Canadian Plant

THERE IS ONE INDUSTRY in Lethbridge, Alberta, Canada, which is expanding in spite of all talk of depression, and that is the business of the Lethbridge Sand and Gravel Co.

Important large orders secured during the past few weeks have resulted in the company adding a new crusher at a cost of $3,600, while another dragline has also been added to bring up the capacity of the plant. As a result of these additions, the plant on the river bottom is capable of producing three times the quantity of sand and gravel that could be put out a year ago.

At present the plant is working two shifts, from 4 a. m to 9 p. m., and is employing 11 men regularly in addition to ten truckers. Three of the trucks are working 24-hour shifts in an effort to keep up to orders which have come from the city, the province and from private undertakings. The plant has been working at top speed since June 15.

The directors of the company are: John Porter, president; A. G. Baalim, vice-president; J. S. Kirkham, secretary-treasurer; Thos. Stubbs and C. S. Donaldson, who has taken the place on the board left by the retirement of C. B. Bowman. New capital has also been added to the company recently to take care of the enlargement of the plant.—*Lethbridge* (Alberta) *Herald.*

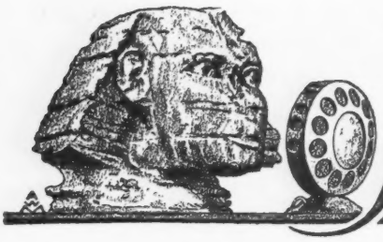
Wisconsin Products Manufacturer to Operate Gravel Pit

THE Lake Shore Cement Products Co., Kenosha, Wis., recently filed a petition in the office of the county clerk asking for permission to construct hoppers in a gravel pit on the east side of the Lake Shore road.

According to the petition filed by the Lake Shore Cement Products Co., and signed by J. W. Girman, the pit has been in operation for the last six years, and was exempt during a recent re-zoning of the district, the Lake Shore Cement Products Co. being given permission to operate on prior right.

A storm which destroyed the building used in the manufacture of cement blocks has forced the company to concentrate on the sale of gravel, and, it is claimed, the installation of new equipment is necessary to conduct the business on a modern scale.

Objections to the installation of the new equipment which have been voiced by neighboring property owners are answered in the petition by the argument that the system now being installed for digging gravel on a conveyor and placing it in the hoppers will cancel the necessity of storing the gravel in open piles, and will improve the appearance as well as the efficiency of the pit.—*Kenosha* (Wis.) *Teller-Courier.*

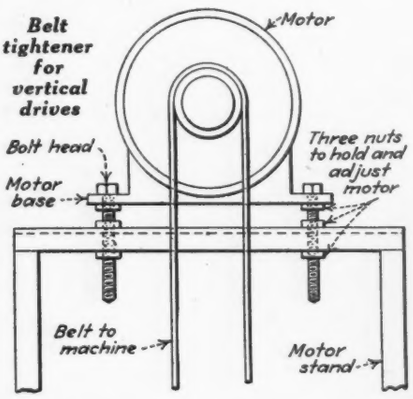


Hints and Helps for Superintendents

Adjustable Belt Tightener for Motor Stand

WHEN A MOTOR is mounted on an upright stand, tightening of the drive belt is difficult owing to the motor base being non-adjustable in this position. A method has recently been described in *Engineering and Mining Journal* to avoid the time-wasting procedure, generally employed, of dismounting the motor and then placing wooden segments under the motor base to raise the motor and thus effect a tightening of the belt, as shown in the accompanying self-explanatory sketch.

The motor, detached from its base, rests on four long tension bolts—in this instance, ⅝x8 in.—each provided with three nuts to



fasten the bolts rigidly to the motor legs and to adjust, level, and bolt the motor to the upright motor stand. To tighten the belt, the nuts below the motor stand are loosened and those in the middle or above the stand are tightened until the belt is rigid and central. The use of washers is recommended if the diameter of the motor feet holes exceeds that of the bolts.

Repairing Large Gyratory Crusher

AT THE DUNDAS, Ont., plant of the Canada Crushed Stone Co., Ltd., a No. 21 Allis-Chalmers gyratory is used as the primary breaker. This crusher, after being in use for several years, developed a crack in the main shell which became so serious that the crusher had to be shut down, thus stopping the entire plant at the height of the shipping season. No extra part was on hand and it would have taken a month or more to receive a new shell from the factory and install it, not to mention the original cost and the incidental freight charges.

It was decided to make a repair using a cast steel band around the cracked shell. The crusher at that point is 33 ft. in diameter.

A wooden pattern was first made to conform to the contour of the shell and from this pattern a band was cast at the Dominion Foundry at Hamilton, Ont. The band was cast in two parts and weighed a total of eight tons. At the ends, the band was cast 8 in. thick and provided with slots to receive the keys that were used to hold the band in place. The main part of the band was cast 5 in. thick and 24 in. wide throughout.

As the job was very urgent, the foundry took the least time possible to anneal the casting, but as the band has now been in place over two years, the shortening of the annealing time apparently was excusable.

Six machined steel keys were made, three for each joint; the upper and lower key at each joint was made 24 in. long and the center key 36 in. long. They weighed a total of 1¼ tons.

Arrow indicates crack in main shell of crusher

Three keys hold reinforcing band

After the band had been put in place, the keys were heated to a yellow-red color and inserted in the slots and allowed to cool naturally, after which about a ton of zinc was poured in between the shell and the band to evenly distribute the crushing strains.

The keys on cooling pulled the cracked parts together securely and when inspected two years after the band was installed there was no visible movement to the parts when the crusher was in service.

The shell cracked at 8 a. m. Monday, July 27, 1928, and by midnight a pattern was made. At 2 p. m. Thursday, August 9, the crusher was in operation, thus requiring a total of 317 hours to complete the job.

The repair work was done under the direction of John Stephens, general superintendent of the Dundas plant of the Canada Crushed Stone Co., Ltd., assisted by R. W. Cunningham, superintendent.

Shaking Screen as Crusher Help

By Chas. Labbe
Death Valley, Calif.

LATELY we were facing the trouble of increasing the capacity of a crusher on a very clayish ore containing a large percentage of fines. Grate and grizzly had been tried but were unsatisfactory in several ways.

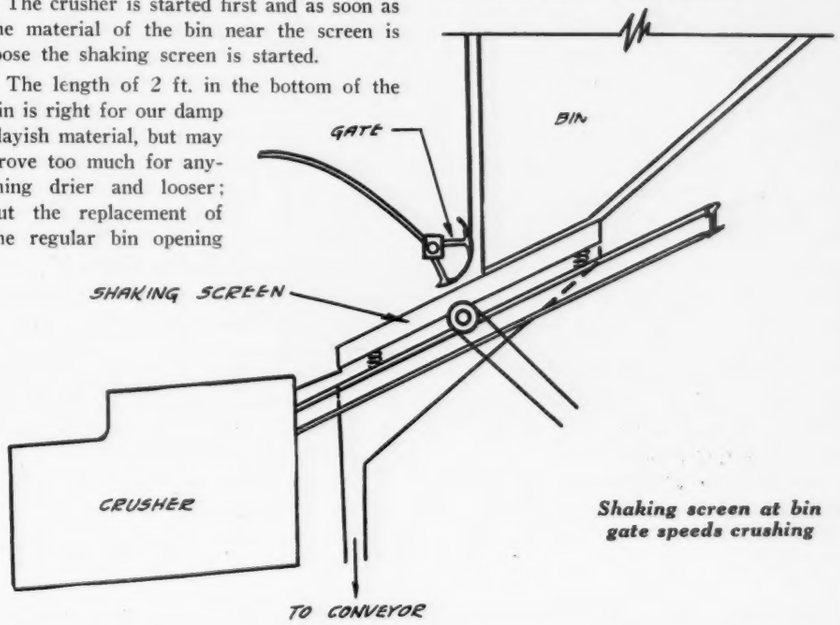
The following change was made and the results proved excellent: The chute and gate were taken out of the bin and a shaking screen was installed to extend 2 ft. into the bin, acting as part of the bottom of the bin.

The shaking screen frame had to be rebuilt of channel iron and I beams to withstand the pressure of the ore. The screen is 2 ft. wide by 4 ft. long. Over the whole length are bolted two pieces of light rail to stop the impact of large pieces when first dumped and also to help them slide off, still leaving open the surface of the screen. The sides are covered by broad flat iron bars fastened to the bottom of the bin to keep the material from working between the sides of the screen frame.

The shaking motion is belt driven, the shaft extending across the frame under the screen. The screen frame is set at an angle of 25 deg. and rests on heavy springs on I beams.

The crusher is started first and as soon as the material of the bin near the screen is loose the shaking screen is started.

The length of 2 ft. in the bottom of the bin is right for our damp clayish material, but may prove too much for anything drier and looser; but the replacement of the regular bin opening by a strong shaking screen has certainly helped our crushing.



Shaking screen at bin gate speeds crushing

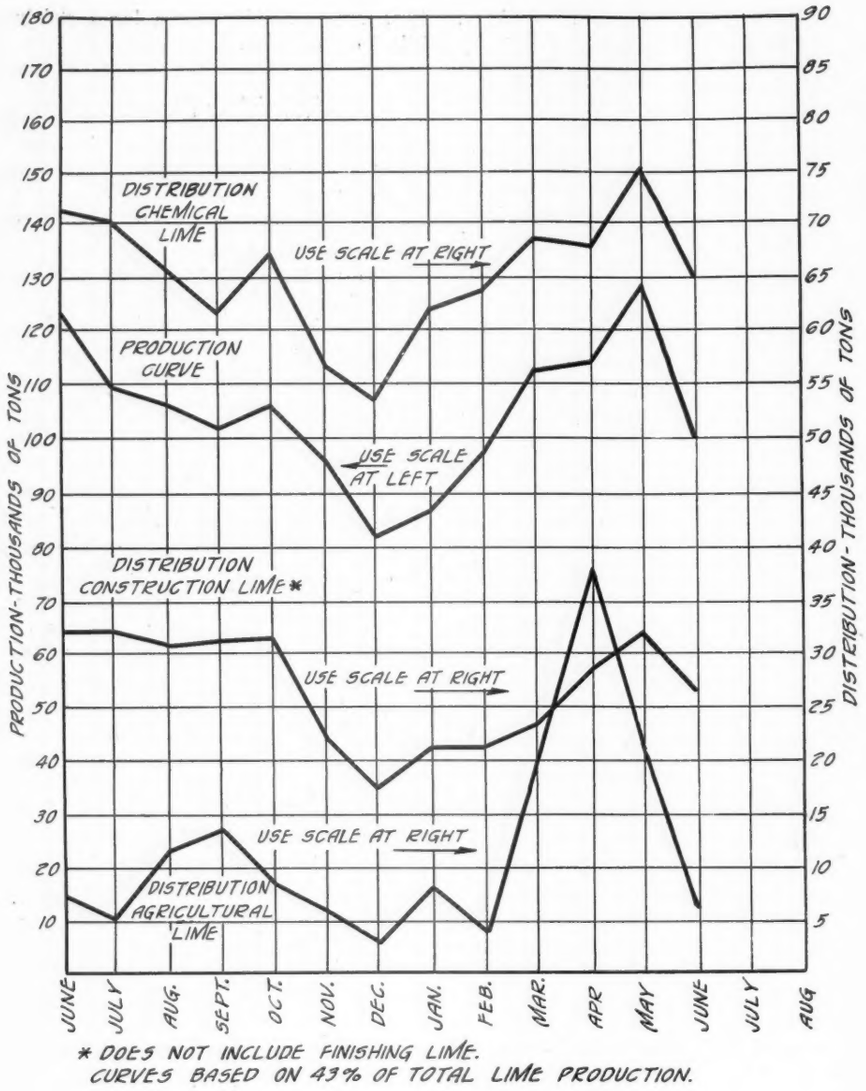
Washing Stone

RECENT CHANGES in specifications in Georgia permit a larger amount of fines in the coarse aggregates provided the fines are stone and not overburden; and to obtain these results it became advisable to wash the stone. Now all stone produced at the Lithonia operation of the Consolidated Quarries Corp. is washed at the Hum-mer screens that are mounted over the loading bins. Incidentally these screens first operated on 12-cycle current but they recently changed to 10-cycle with better results.

A Practical Test for Absorption

W. E. BARNEY, superintendent of the Haydite plant of the Hydraulic Press Brick Co., at South Park, Ohio, has devised a novel and extremely effective method of demonstrating absorption in Haydite building units as well as competitive products. The unit is placed in a shallow pan of water and a series of small holes are dug or bored from the water line to the top of the block at intervals of about one or two inches. Matches are inserted head foremost into these holes. At any time during the test the height to which the water has risen is shown by the condition of the matches, those above the limit of absorption being ignited readily.

Another adaptation of the same idea illustrates the watertightness of a wall made of Haydite units and exterior stucco. A small shelter over a well was stuccoed by a Cleveland contractor and one wall has been sprayed with water continuously for several weeks. Matches inserted in numerous holes in the interior wall can be ignited easily, demonstrating non-absorption of the wall and absence of condensation.


DISTRIBUTION CHEMICAL LIME
USE SCALE AT RIGHT
PRODUCTION CURVE
USE SCALE AT LEFT
DISTRIBUTION CONSTRUCTION LIME*
USE SCALE AT RIGHT
USE SCALE AT RIGHT
DISTRIBUTION AGRICULTURAL LIME
PRODUCTION-THOUSANDS OF TONS
DISTRIBUTION-THOUSANDS OF TONS
JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR MAY JUNE JULY AUG
* DOES NOT INCLUDE FINISHING LIME.
CURVES BASED ON 43% OF TOTAL LIME PRODUCTION.

Survey of lime industry for 13 months

Lime Statistics

THE ACCOMPANYING CHART shows statistics of operations in the lime industry for a 13-month period ending in June, 1931.

This information, supplied by the National Lime Association, represents only 43% of the total lime production of the country. Reasonable accuracy in estimating total production and distribution should be obtained from it by doubling the amounts shown in the accompanying chart.

Tennessee to Operate Crushers

POLITICIANS are now entering another field, as is evidenced by a recent article in the *Springfield* (Tenn.) *Times*. In a recent conversation with a county agent the State Commissioner of Agriculture said that lime crushing outfits will be placed under the supervision of the Tennessee State Department of Agriculture.

The legislature appropriated $25,000 to be used in buying pulverizers and tractors. It is the purpose of the state department of agriculture to operate these outfits in the various counties of the state at the least possible cost to the farmers. Dr. Fitts suggested that any community interested in having lime crushed at actual cost should at once get in touch with their county agent in order that sufficient tonnage may be pledged in communities to justify the outfit in coming to that community. The entire plan may be summarized as follows:

1. The state will furnish machinery and two men to operate each outfit. No further expense will be borne by the state.

2. The farmer will supply all necessary help and pay all costs and charges incidental to purchase of stone, quarrying and transportation.

3. The farmer will pay board or provide same for two state men.

4. Where limestone is available for grinding on farms the county agent will submit to the state office list of farmers who want lime and the amount desired and will assist in arranging an itinerary which will insure the least amount of travel for the outfit.

5. Not more than 60 tons of lime per year will be furnished to any one farmer.

6. A club order will not be considered unless there is a minimum of 500 tons to be crushed within a radius of 10 mi., in any given locality.

County Agent H. H. Jones states that according to Commissioner Fitts the purpose of this movement is to give an opportunity for the farmers to get a few tons of lime crushed on their farms at a reduced price.

Extend Program of Illinois State Geological Survey

THE Illinois State Geological Survey recently announced an extended program of mineral research involving studies of resources, utilization, and marketing. The survey will comprise a geological resource section of geological specialists in coal, nonfuels, oil and gas, sub-surface data, areal geology, engineering geology, sedimentary petrography, stratigraphy and paleontology; a geochemical section of specialists in organic, physical, analytical and industrial chemistry, and a geophysicist in the broader sense; and a mineral economics section. Cooperative topographic mapping with the U. S. Geological Survey will continue as heretofore. The appropriation measure recently passed by the Illinois state legislature and signed by Governor Emmerson carries an appropriation to cover the work planned, amounting to about $470,000 for the biennium. The new laboratory facilities will be housed in temporary quarters provided by the University of Illinois, pending the developments of further plans for the provision of quarters adequate to permit consolidation of the work of the survey.—*Mining and Metallurgy.*

To Erect Bins for River Sand Shipments

A PERMIT has been granted the Eastern Ohio Sand and Supply Co., East Liverpool, Ohio, by United States engineers at Pittsburgh for the construction of two steel bins on the right bank of the Ohio river at Port Homer, 8 mi. below East Liverpool, which will be used for storing sand and gravel to be used on Ohio state route No. 7, Albert E. Frosch, general manager, said recently.

The company has received a contract from Newell and Smith of Defiance, sub-contractors on the road improvement, to supply 10,000 tons of sand and gravel. A derrick boat owned by the local concern will unload and store the material in the bins.

Applications for federal permits for river construction are on the increase, United States engineers at the Pittsburgh office announced recently.—*East Liverpool* (Ohio) *Review.*

Editorial Comment

Soundness of Aggregates

There is always something new to worry the producers of aggregates. Once it was fineness modulus and gradation, then it was maximum size, deleterious materials; and now it is soundness. Not that these things are unimportant—they are very important—but there are always some buyers of aggregates who will make too much of every new idea. For example, an engineer who sent a hundred miles for concrete sand because the local sand (which had given good service for years) had a few specks of mica in it. Undoubtedly today perfectly good aggregates, that have made a concrete resistant to wear and weather for years, are being turned down by purchasers who have recently learned of soundness tests and want to judge aggregates by their behavior in the sodium sulphate test, regardless of other considerations.

Fortunately we are beginning to have information that enables us to place the responsibility for failure or short life of concrete. Quite recently the relations of soundness of aggregates to the durability of concrete have been studied by research men recognized as authorities on all that pertains to concrete. And the net result of their work is that sometimes unsound aggregates are responsible for lack of durability in concrete, but more often it is due to too much water, bad gradation, dirty aggregates, poor mixing and placing, all things that the engineer in charge can remedy because he has them under his control. Young, after studying numerous examples of concrete failure in a section where climatic conditions are very severe, reported that "at least 75% of the concrete that is in trouble today is so because its makers permitted entirely preventable conditions to occur during construction."

Some four years ago Shuler showed the close relationship of water-cement ratio and resistance to freezing and thawing. The recent work of Goldbeck confirms this. He finds that resistance to freezing and thawing increases as the free water in the concrete decreases.

Gonnerman and Ward have recently found that a low water-cement ratio is all important to durability. They found that rich mortars, made with a low water-cement ratio, will so protect unsound aggregates that the concrete made from them withstands 200 cycles of freezing and thawing. The bad effect of a high water-cement ratio on durability may be taken as proven, but soundness of aggregates has nothing to do with this, although grading and other characteristics may have a great deal to do with it.

Goldbeck also found that eminently sound sands would sometimes make unsound mortar and that unsound sands would sometimes make sound mortar. He does not explain this, and it is evident that a complete explanation would call for much study. But if anything, it shows that some factor other than the soundness of the sands affected the durability of the mortars. Gonnerman and Ward found that conspicuously unsound sands would make unsound mortars, but they also found that some sands which were structurally sound had such high water requirements for the workability desired that they would not make sound mortars in the usual proportions. Grading seemed to have a great influence on durability, harsh gradings making mortars that have a low resistance to freezing.

The recent work on coarse aggregates also shows that other things than their soundness or unsoundness may affect durability. Goldbeck found that an unsound stone did not crack the concrete nor did the stone leave the concrete or cause pitting. Only after the mortar failed did the stone fail by continuous chipping. The tests of Gonnerman and Ward had passed through only 40 cycles when their paper was written, but at that point only the specimens having a high water-cement ratio gave evidence of failure, even among those containing unsound aggregates.

Now to say what has been said is not to say that there are *no* aggregates so unsound as to affect the durability of concrete. There is ample evidence to the contrary. Here, too, we are fortunate in being able to place the responsibility, so far as certain minerals are concerned. Gonnerman and Ward list shale, chert, argillaceous limestone and argillaceous sandstone as often if not always so unsound that mortars and concrete made from them will be unsound. Others, such as partially weathered feldspar, ochre, and some soft rocks with local names like "chocolate bars" and "floaters," might have been added.

But here, too, one should not condemn too sweepingly. Lang, who perhaps has been studying the effect of such materials as long as anyone, is evidently of this opinion. He said in a recent paper: "It is my thought that we should omit the word deleterious and have definite tests with suitable test limits based on the behavior of these mineral particles." He would also set the test limits according to the use and exposure for which the concrete is designed. If this is not done the supply of aggregate in some parts of the country will be greatly curtailed.

One conclusion that may be drawn from recent studies of soundness of aggregates and concretes is that they tend to confirm the practice of concrete engineers of experience. They show that aggregates with more than a small percentage of minerals which may cause unsoundness should be rejected, as they would be by any of the standard aggregate specifications. With smaller percentages they may be used if experience has shown them to stand up well in the locality. They may also be used where the exposure is not severe, for common sense should tell us that aggregates that will not do for such service as traffic and weather give concrete highways will do for concrete not exposed to such hard conditions. Climate should be taken into consideration, as aggregates which are not usable in one section are quite usable in another. In a word, good judgment should govern the application of the soundness test and the interpretation of its results.

Rock Products Clinic

On Masonry Cements

THE EDITOR: I have read with interest your editorial in the July 18 issue of Rock Products in which you discuss "Masonry Cements."

It is quite true that, in the last few years, some very unsatisfactory masonry construction has been produced. Just what the contributing factors in this situation may be has not fully been determined, but the present investigation being carried out at the Bureau of Standards should go a long way toward solving the problem.

You call attention to the fact that in recent years lime mortar has been largely supplanted by other materials and that the change to the so-called patented masonry cements may be responsible for much of the trouble. Mr. Palmer's conclusions bear this out to a certain extent.

I believe, however, that you have overlooked one class of cementing materials which is neither new nor untried. I refer to the masonry cements which are made from high grade natural cements, of which there are several on the market today. These cements have been used in this country for upwards of a century and have been adapted to meet the needs of modern masonry construction in every way. There is no lack of evidence in the form of fine buildings to prove that this class of cements produces now, and has produced for a great many years the highest type of masonry work. If the test of time is worth anything, surely the natural cements need not be ashamed of their record.

One thing is certain. If there has been a radical change in the quality of masonry construction in the last few years, it has not been caused by the introduction of this class of masonry cements into the field. They have been in that field too long to be considered strangers.

I believe that, in all fairness to this industry, these facts should be taken into account in any discussion of masonry cements.

Utica Hydraulic Cement Co.
S. G. Seaton, Chemist.

* * *

THE EDITOR: As a recent subscriber to Rock Products I would comment: Your editorial re masonry cement is echoing the advertising campaign of the National Lime Association and is not worthy of technical discussion as not possessing basic facts that present endorsed masonry cements are not as good or better than former cements and quite as leak-proof.

Mr. Hough's address to the Boston Chamber of Commerce was imaginary, based on fallacies, mere advertising propaganda, nothing new.

The Gypsum Association has been guilty of equal fallacies to obtain publicity.

Experts of the highest repute so report to me as listeners. If trouble exists it lies in the 8-in. brick wall as against 12- to 18-in. formerly used, or the inefficient rapid method of brick laying.

Parker C. Choate, Essex, Mass.

* * *

Can the United States Increase Its Gold Output from Gravel and Sand Beds by Paying a Bounty?

SEVERAL YEARS AGO it was the hue and cry that the oil supply would give out in a short period of years. Wells were drilled all over the world, with the result that we have an overproduction.

Now if we create such a line of thinking about the falling off in the gold production it will create a new impetus to increase the production of gold.

We cannot have an overproduction of gold because gold is held in value at about $20 per ounce the world over. Merchandise, the value of which is measured in gold, and gold itself, are the international media of exchange between all nations.

How are we to increase the production of gold in the United States? It is safe to say that there are millions in gold values in gravel and sands, yet to be recovered, some of which are going into concrete construction, or lost in the fines. I will give one example where they have tried to save gold values. It is the Camp Concrete Rock Co., near Brooksville, Fla. The rock is stated to resemble alluvial or limestone gravel recemented by a soft limestone. It is blasted to loosen the bed and then resembles a mass of wet muck. After washing, 50 to 60% is recovered for concrete work. The balance is fines that are run into ponds and saved. These fines are reported to assay as high as $6.40 per ton gold values, but as a whole average 40c to 60c per ton. When running to capacity the output of the Camp company is 2500 tons per day. (Rock Products, April 13, 1929.) Some 40% being fines, that would be a loss of about $400 per day of gold values at the lowest average assay of 40c per ton.

The Camp company has tried to save these values. What results they have had I do not know, but the fact that they are alert and trying should be an example to other gravel and sand producers to assay their holdings and see if they have gold values.

Howard Kenyon, president of the Howard Kenyon Dredging Co., Houston, Tex., writes me that he read my article, "Gold in Gravel Beds," in the November 22, 1930, issue of Rock Products, and was interested, as he had already taken steps to work a large deposit of gravel on the Gila river in Arizona. My article strengthened his own idea of the possibilities in the dry and wet places of Arizona and New Mexico, although in most cases no use could be made of the gravel and sand.

Mr. Kenyon reports that the gravel deposit here runs 20c to $1 per cu. yd., and with modern walking draglines, diesel engines, screens and trucks he believes that the values can be saved at a profit.

The past failures to recover these values should be a stimulant to all rock products machinery manufacturers to help solve this problem. It will eventually be solved and millions of dollars worth of old and new equipment be demanded in Arizona and New Mexico.

The first thing is to solve the problem. If Mr. Kenyon has that good fortune he should be given full credit for having the courage to start on an old line of endeavor with a new line of ideas, applying the above mentioned modern equipment.

It is an established fact that the state of Arizona was at one time an ocean bed and through some whim of nature was raised up. For this reason we may expect that nature has done the grinding up of the rocks and boulders to a great extent in ages gone by and left a huge field to work on for scattered low-grade placers of vast yardage or tonnage. If all the 20c values per yard could be recovered from the gravel and sand of these two states it would give employment to many thousand men and add to the output of gold in the United States by some millions of dollars each year.

My idea for the increase of gold production in the United States from gravel and sand deposits is this: The Bureau of Mines should send to every large gravel and sand producer a blank to be filled out something as follows:

Name of firm.....
Location, etc.....
Do you obtain your gravel and sand by dredging?.....
Do you obtain your gravel and sand from dry deposits and wash same?.....
Capacity per day.....
Does your deposit show gold values?.....
If so, what?.....
Would you like to have your deposit assayed?.....
Have you tried to save any gold values?.....
If so, would you please give methods tried.....

A postscript I would add to these questions: "The Bureau of Mines will help work out your problem in cooperation with all other gravel and sand producers, also dry and wet placer operators. By the exchange of ideas and cooperation we hope to recover low gold values in gravel and sand deposits. Please always keep in mind you cannot have an overproduction of gold."

I believe the government should give a bounty for gold values recovered from gravel and sand used for cement construction for a limited number of years to encourage the saving of the small gold values.

Also a bounty on gold recovered from dry placers that carry values of 10c or possibly 20c per cu. yd. where gravel cannot be made use of. Just what amount these bounties should be would be based on cost of production.

The importance of increasing our gold output should be apparent, although some claim money is too cheap or abundant now; that only applies to the fellow who has money to lend, not to me or perhaps you or the general public. I wish to impress upon every nonmetallic mineral producer the importance of increasing the gold output. It is just as important to you to help recover every possible ounce of gold as it is for a bona fide gold miner.

I would like to see the gravel and sand producers make a start in saving of gold values in the next few years. For instance, if the Camp Concrete Rock Co. could report a profitable method as applied to their fines it would offer an example to others.

I am very bullish about the great possibilities of the gravel and sands of Arizona and New Mexico, not from any stock selling scheme, but in a bona fide effort of the Bureau of Mines, capital, machinery and labor to obtain these gold values that are known to exist there, so as to give employment to many thousands of laborers.

Forget about copper and oil for a while, talk gold, think gold; in other words, be "gold-minded," get the spirit of the Forty-niners.

The modern diesel engine, walking dragline, modern screens, power shovels and conveyors and modern gold recovery methods, together with new ideas, are going to make the gravel and sand beds of Arizona and New Mexico give up their riches. Possibly large pipe lines of water similar to the oil lines will reach out to the dry placers to provide central gold recovery stations by the old wet processes.

Possibly concrete roads eventually will strike out through rich sections and make trucking speeds faster, so the fine concentrates can be hustled to the nearest central station for gold recovery. These fines after screening would possibly run $10 to $12 per cu. yd. or about $50 per truck load. With trailers this amount could be greatly increased.

May Stimulate Road Building

The government should give liberal aid to such road building in Arizona and New Mexico that will open up vast dry placers. Possibly new trunk line roads from the potash deposits of Texas and New Mexico and Arizona to the Imperial Valley may open up new fields of operation. New towns and cities will spring up.

The southwestern states are going to absorb much of the unemployed help in the next few years. I am sure of one thing, I cannot be accused of hanging crepe on the front door of our southwestern neighbors, but I am painting the picture as my mind sees it and I hope this picture becomes a reality.

Texas, Arizona, New Mexico, Nevada and southern California have a bright future before them with the Hoover dam construction going on and the revival of the search for gold in the dry and wet placers of Arizona and New Mexico. Now let's all get together and help boost the production of gold! In so doing you will help the gravel and sand, cement, and mining machinery producers.

If the bona fide gold producers will hustle, too, prosperity will soon be here. If you want copper to sell for 12c, crude oil at a profit, cement mills to capacity, more buildings erected, more roads built, manufacturing of all descriptions running near to capacity, then help increase the supply of gold. Don't let the tariff worry you. We have to have a tariff until the world-wide standard of living is equalized.

We could wipe out most of our surplus production here in the United States in most lines of merchandise right now if we had the wherewithal (gold) to make the needed purchases. The trouble is the money is not individually held and stagnant in circulation.

The year 1930 was a red-ink year for most of us owing to the stagnation of money. And 1931 is likely to be more so. Let us make 1932 a black-ink year.

Thoughts about the idea set forth in the above article should lead to action; action should lead to methods; exchange of ideas and methods should lead to profitable recovery of gold values.

P. S.—Since writing the above on gold recovery from sand and gravel beds the article "Reworking Gold Dredge Wastes for Gravel Held as a Community Benefit" attracted my attention in the March 14, 1931, issue of Rock Products, page 58.

Here we have a case where the gold values were recovered years ago and now for the past few years the gravel from this bed is being used for concrete and for railroad beds. Over 200 acres have been cleared at a profit.

I think all the readers of my articles setting forth the recovery of small gold values from sand and gravel beds as a side profit to the business will have positive proof in reading this article in Rock Products that my idea is absolutely sound. If this bed had been worked for gold and gravel at the same time a big saving would have been made, but at the time this gravel bed was worked for gold only there existed no call for gravel. Today we have a huge call for gravel and sand.

I would like to state right here that some state officials do not seem to realize the big boost that the cement manufacturers have been to the sand and gravel industry, and instead of helping them in their forward march, would crush them from existence in several states. No state ever made the pioneer steps, of which there were many, in bringing about the perfection and general use of cement.

A few states seem inclined to butt into a business that inventors, laborers and capital have built up and made possible, and these would-be state treasury protectors are really stealing another man's thunder.

Keene, N. H. Herbert N. Kirk.

* * *

On Proposed Freight Rate Increase

THE EDITOR: We have been wondering for some time what the producers of sand and gravel were going to do about the present application which the railroads have in for a 15% advance in freight rates.

The railroads necessarily are in position to get just about as much publicity as they desire; they are so situated that they can shape it pretty much to suit themselves, and for the most part the public will sit idly by and take what they get.

We feel that a fund should be established through donations from the different manufacturers throughout the whole United States, this fund to be used to send as many representative sand and gravel men to Washington as it is possible to send, that they see to it that the sand and gravel side of it is properly presented to the Interstate Commerce Commission.

If every producer would contribute ten or fifteen dollars it seems to me that would be sufficient to handle the matter, and we would certainly like to see some such move started. If it goes through we would like to see the editor of Rock Products one of the men sent to Washington, and you can have our check for ten or fifteen dollars whenever you are ready for it. We will be glad to have your opinion regarding the advisability of such a move.

W. J. Garrison, Manager,
Silicon Products Co.,
Ridgway, Penn.

Editor's Reply

Rock Products and its editor deeply appreciate the implied compliment in the above communication, and we will hold ourselves in readiness to appear at any of the hearings as an expert witness, without compensation, should our services be desired. But, we feel that the case of the sand and gravel industry will be well and adequately handled by the National Sand and Gravel Association, which has already employed an expert traffic counsel and is fully prepared to present its case on behalf of the industry. The association will, of course, very generously assume the costs, although the case will be of equal benefit to non-members and members alike. We have no authority whatsoever to make the suggestion, but we see no reason why the voluntary contribution of any producer in the sand and gravel industry should not be made to the National Sand and Gravel Association, and we believe it would be acceptable and eminently fair to all concerned.—The Editor.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	8-11-31	92	.....	
Alpha P. C. new com.[2]	8- 9-31	13	14	25c qu. July 25
Alpha P. C. pfd.[3]	8- 9-31	105	120	1.75 qu. June 15
Amalgamated Phosphate Co. 6's, 1936[19]	8- 8-31	95	100	
American Aggregates com.[19]	8- 8-31	4	8	75c qu. Mar. 1
American Aggregates pfd.[19]	8- 8-31	65	75	1.75 qu. July 1
Amer. Aggr. 6's w.w.[19]	8- 8-31	60⅛	65	
American Aggr. 6's ex. w.[19]	8-18-31	57⅛	62	
American Brick Co., sand-lime brick	5- 4-31	.....	7	25c qu. Feb. 1, '30
American Brick Co. pfd.	5- 4-31	52¼	57	50c qu. May 1, '30
Am. L. & S. 1st 7's[19]	8- 8-31	96	99	
American Silica Corp. 6½'s[39]	8-11-31	No market		
Arundel Corp. new com.	8- 5-31	36¼	.....	75c qu. July 1
Beaver P. C. 1st 7's[20]	7-23-31	90	94	
Bessemer L. & C. Cl. A	8-10-31	17½	19	50c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	7-24-31	65	75	
Bloomington Limestone 6's[27]	8-11-31	45	50	
Boston S. & G. new com.[37]	8- 8-31	8½	11	15c qu. July 1
Boston S. & G. new 7% pfd.[37]	8- 8-31	36	39	87½c qu. July 1
California Art Tile A[9]	8- 7-31	.....	5	43¾c Mar. 31
California Art Tile B[40]	8- 7-31	.....	1	20c qu. Mar. 31
Calaveras Cement com.	8- 7-31	.....	5	
Calaveras Cement 7% pfd.	8- 7-31	.....	78	1.75 qu. July 15
Canada Cement com.	8- 9-31	9½	10	
Canada Cement pfd.	8- 9-31	84¾	.....	1.62½ qu. June 30
Canada Cement 5½'s[42]	8- 8-31	99	99¾	
Canada Cr. St. Corp. bonds[42]	8-18-31	80	90	
Canada Crushed Stone com.[41]	7-21-31	.....	13	
Canada Crushed Stone pfd.[41]	8- 8-31	.....	76	
Certainteed Prod. com.	8-10-31	5¼	5½	
Certainteed Prod. pfd.	8-10-31	30	35	1.75 qu. Jan. 1
Cleveland Quarries	8-10-31	.....	62	75c qu. June 1
Columbia S. & G. pfd.	8- 6-31	87	92	
Consol. Cement 1st 6½'s, A[44]	8-11-31	No market		
Consol. Cement Notes, 1941[27]	8-11-30	25	30	
Consol. Cement pfd.[27]	8-11-30	10	20	
Consol. Oka S. & G. 6½'s[12] (Canada)	8- 6-31	98	100	
Consol. Rock Prod. com.[9]	8- 7-31	50c	75c	
Consol. Rock Prod. pfd.[9]	8- 7-31	4½	5	43¾c qu. June 1, '30
Consol. Rock Prod. units	8- 9-31	2	4½	
Consol. S. & G. pfd. (Can.)	8- 9-31	60	70	1.75 qu. Aug. 15
Construction Mat. com.	8-10-31	6	9	
Construction Mat. pfd.	8-10-31	27⅛	28	87½c qu. Aug. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	8- 6-31	55	65	
Coosa P. C. 1st 6's[27]	8-11-31	40	50	
Coplay Cem. Mfg. 1st 6's[19]	8- 8-31	50	60	
Coplay Cem. Mfg. com.[33]	7-25-31	5	7½	
Coplay Cem. Mfg. pfd.[33]	7-25-31	25	40	
Dolese & Shepard	8-10-31	38	42	$1 qu. July 1
Dufferin Pav. & Cr. Stone com.	8- 9-31	6	7	
Dufferin Pav. & Cr. Stone pfd.	8- 9-31	.....	67	1.75 qu. July 2
Edison P. C. com.[32]	8- 7-31	1½	.....	
Edison P. C. pfd.[32]	8- 7-31	5	.....	
Federal P. C. 6½'s, 1941[19]	8- 8-31	95	100	
Giant P. C. com.[2]	8- 9-31	2	4	
Giant P. C. pfd.[2]	8- 9-31	14	18	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	8- 3-31	7⅝	8	20c qu. June 30
Hermitage Cement com.[31]	8-10-31	15	20	
Hermitage Cement pfd.[31]	8-10-31	70	75	
Ideal Cement, new com.	8-10-31	31½	33½	75c qu. July 1
Ideal Cement 5's, 1943[29]	8- 8-31	99½	101	
Illinois Electric Limestone 1st 7's[38]	8- 8-31	92½	98½	
Indiana Limestone com.[27]	8-11-31	.....	2	
Indiana Limestone pfd.[27]	8-11-31	.....	40	
Indiana Limestone 6's	8- 8-31	25½	26	
International Cem. com.	8-10-31	30	30¾	$1 qu. June 30
International Cem. bonds 5's	8- 8-31	84½	85	Semi-ann. int.
Iron City S. & G. bonds 6's[36]	6-26-31	80	90	
Kelley Is. L. & T. new stock	8-10-31	.....	27	50c qu. July 1
Ky. Cons. St. V. T. C.[38]	8- 8-31	No market		
Ky. Cons. Stone 6½'s[38]	8- 8-31	70	80	
Ky. Cons. Stone com.[38]	8- 8-31	2	5	
Ky. Cons. Stone pfd.[38]	8- 8-31	60	70	1.75 qu. May 1
Ky. Rock Asphalt com.[11]	8-10-31	4	5	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	8-10-31	73	80	1.75 qu. June 1
Ky. Rock Asphalt 6½'s[11]	8-10-31	90	95	
Lawrence P. C.	8- 5-31	39	44	$1 qu. June 30
Lawrence P. C. 5½'s, 1942[2]	8- 9-31	78	84	
Lehigh P. C.[2]	8- 9-31	10	11	25c qu. May 1
Lehigh P. C. pfd.	8-10-31	89⅛	95	1.75 qu. July 1
Louisville Cement[45]	8- 9-31	175	225	
Lyman-Richey 1st 6's, 1932[13]	8- 7-31	95	.....	
Lyman-Richey 1st 6's, 1935[13]	8- 7-31	92	.....	
Marblehead Lime 6's[14]	8- 7-31	90	.....	
Marbelite Corp. com.[35] (cement products)	8- 6-31	.....	2	
Marbelite Corp. pfd.[35]	8- 6-31	1	.....	50c qu. Oct. 10, '30
Material Service Corp.	8-10-31	17⅛	19	50c qu. June 1
McCrady-Rodgers 7% pfd.[22]	8- 6-31	45	47	87½c qu. June 30
McCrady-Rodgers com.[22]	8- 6-31	15	20	75c qu. Jan. 26
Medusa Portland Cement	8-10-31	31	33	75c qu. Apr. 1
Michigan L. & C. com.[6]	8- 7-31	50	.....	
Missouri P. C.	8-10-31	20	21	50c qu. July 31
Monolith Portland Midwest[9]	8- 7-31	1	2	
Monolith P. C. com.[9]	8- 7-31	1	2	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	8- 7-31	2	3	40c s.-a. Jan. 1
Monolith P. C. units[9]	8- 7-31	5	7	
Monolith P. C. 1st Mtg. 6's[9]	8- 7-31	73	77	
National Cem. (Can.) 1st 7's[34]	7-24-31	101	.....	
National Gypsum A com.	8-10-31	3⅝	4⅛	
National Gypsum pfd.	8-10-31	43	45	$1 Oct. 1
Nazareth Cement com.[25]	8- 8-31	5	12	
Nazareth Cement pfd.[25]	8- 8-31	75	85	
Newaygo P. C. 1st 6½'s[27]	8-11-31	98	100	
New England Lime 6's, 1935[19]	8- 8-31	40	60	
N. Y. Trap Rock 1st 6's	8- 5-31	94½	96	
N. Y. Trap Rock 7% pfd.[30]	8- 7-31	95	.....	1.75 qu. July 1
North Amer. Cem. 1st 6½'s	8- 5-31	39	40	
North Amer. Cem. com.[27]	8-11-31	1	1¾	
North Amer. Cem. 7% pfd.[27]	8-11-31	6	10½	
North Shore Mat. 1st 5's[15]	8-11-31	80	.....	
Northwestern States P. C.[31]	8- 8-31	95	.....	$2 Apr. 1
Ohio River Sand com.	8-10-31	.....	14	
Ohio River Sand 7% pfd.	8-10-31	.....	98	
Ohio River S. & G. 6's[16]	8- 9-31	80	90	
Oregon P. C. com.[9]	8- 7-31	8	12	
Oregon P. C. pfd.[9]	8- 7-31	80	85	
Pacific Coast Aggr. com.[40]	8- 7-31	.....	75c	
Pacific Coast Aggr. prd.[40]	8- 7-31	.....	1½	
Pacific Coast Cement 6's[5]	8- 6-31	54	56	
Pacific P. C. com.	8- 7-31	.....	12	
Pacific P. C. pfd.	8- 7-31	.....	65	1.62½ qu. July 3
Pacific P. C. 6's[5]	8- 6-31	99	.....	
Peerless Cement com.[1]	8- 7-31	1	1½	
Peerless Cement pfd.[1]	8- 7-31	22	33	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	8-10-31	2¼	2½	
Penn.-Dixie Cement pfd.	8-10-31	10	11	
Penn.-Dixie Cement 6's	8- 5-31	58¼	60	
Penn. Glass Sand Corp. 6's	8- 5-31	100	102	
Penn. Glass Sand Corp. pfd.	7- 8-31	90	.....	1.75 qu. July 1
Petoskey P. C.	8-10-31	.....	5	15c qu. Apr. 1
Port Stockton Cem. com.[9]	8- 7-31	No market		
Riverside Cement com.	8- 7-31	.....	13	
Riverside Cement pfd.[5]	8- 6-31	56	60	1.50 qu. Aug. 1
Riverside Cement, A[5]	8- 6-31	5	10	15c qu. Feb. 1
Riverside Cement, B[35]	8- 6-31	75c	1	
Roquemore Gravel 6½'s[17]	8- 8-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	8- 8-31	90	100	
Santa Cruz P. C. com.	8- 7-31	84	.....	$1 qu. July 1
Schumacher Wallboard com.	8- 7-31	6⅛	11	25c qu. June 27
Schumacher Wallboard pfd.	8- 7-31	14	22	50c qu. Aug. 15
Southwestern P. C. units[35]	8- 6-31	235	275	
Standard Paving & Mat. (Canada) com.	8- 9-31	5	5⅞	50c qu. May 15
Standard Paving & Mat. pfd.	8- 9-31	.....	70	1.75 qu. Aug. 15
Superior P. C., A	8- 7-31	36½	38	27½c mo. Sept. 1
Superior P. C., B	8- 7-31	7	.....	25c qu. Mar. 20
Trinity P. C. units[31]	8- 8-31	95	112	
Trinity P. C. com.[31]	8- 8-31	17	.....	
Trinity P. C. pfd.[27]	8-11-31	90	.....	
U. S. Gypsum com.	8-10-31	37	37½	40c qu. June 30
U. S. Gypsum pfd.	8-10-31	125	135	1.75 qu. June 30
Wabash P. C.[21]	8- 9-31	.....	22	
Warner Co. com.[16]	8- 9-31	23	23½	25c qu. July 15
Warner Co. 1st 7% pfd.[16]	8- 9-31	90	94	1.75 qu. July 1
Warner Co. 1st 6's[8]	8-11-31	84	85½	
Whitehall Cem. Mfg. com.[30]	8- 7-31	75	.....	
Whitehall Cem. Mfg. pfd.[30]	8- 7-31	50	.....	
Wisconsin L. & C. 1st 6's[15]	8-11-31	80	.....	
Wolverine P. C. com.	8-10-31	1¼	4	15c qu. Nov. 15
Yosemite P. C., A com.[9]	8- 7-31	.....	10	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. &Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Montreal. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky.

International Cement Earnings

THE consolidated profit and loss statement of the International Cement Corp. and subsidiaries, giving the results from operations for the second quarter of 1931 as compared with the results for the first quarter of 1931, is as follows:

	Second quarter 1931	First quarter 1931
Gross sales	$8,868,624.98	$6,111,424.51
Less: Packages, discounts and allowances	1,974,100.16	1,178,498.86
Net sales	$6,894,524.82	$4,932,925.65
Manufacturing cost, excluding depreciation	$3,798,274.45	$2,644,879.36
Depreciation	835,199.65	467,625.38
	$4,633,474.10	$3,112,504.74
Manufacturing profit	$2,261,050.72	$1,820,420.91
Shipping, selling and administrative expenses	1,146,403.88	1,055,370.06
Net profit	$1,114,646.84	$765,050.85
Less: Interest charges and financial expenses	190,086.83	193,135.71
	$924,560.01	$571,915.14
Reserves for federal taxes and contingencies	334,841.84	161,005.86
Net to surplus	$589,718.17	$410,909.28

These earnings, after allowing for interest on gold debentures, are equivalent to $1.57 per share on 636,124 shares of common stock now outstanding. The second quarter earnings for 1931 and 1930 follow:

CONSOLIDATED EARNINGS, THREE MONTHS TO JUNE 30:	1931	1930
Gross sales	$ 8,868,625	$ 9,051,665
Expenses, etc.	6,918,779	6,529,341
Depreciation	835,199	788,908
Balance	1,114,647	1,733,416
Interest, taxes, etc.	524,929	523,134
Net income	$ 589,718	$ 1,210,282
Earned per share	$0.92	$1.91
Six months to June 30:		
Gross sales	$14,980,049	$16,291,409
Expenses, etc.	11,797,527	12,035,628
Depreciation	1,302,825	1,279,945
Balance	1,879,697	2,975,836
Interest, taxes, etc.	879,070	924,074
Net income	$ 1,000,627	$ 2,051,762
Earned per share	$1.57	$3.25
Number of shares	636,124	631,356

North American Cement Passes Preferred Dividend

AT A MEETING of the directors of the North American Cement Corp., Albany, N. Y., it was decided not to pay the dividend on the preferred stock of the company which would have fallen due August 1. The official announcement stated: "After much careful consideration, your board of directors have decided not to pay a dividend on the preferred stock on August 1, 1931. Under present conditions of depression and intense competition in the cement market, it is impossible to earn the dividend this year. These same conditions require the conservation of the cash resources of the company in the interests of the stockholders. Every stockholder may feel assured that the directors will be alert to pay preferred dividends as soon as conditions warrant it."

The report of operations for 6 months ending June 30 follows:

	1931	1930
Net loss, after taxes, depreciation, depletion, interest, etc.	$210,997	$49,374

Pennsylvania-Dixie Annual Report

THE ANNUAL REPORT of the Pennsylvania-Dixie Cement Corp., New York, N. Y., for the year ending June 30, 1931, and the comparative statement for the preceding year follows:

CONSOLIDATED EARNINGS, 12 MOS. TO JUNE 30	1931	1930
Gross profits	$2,011,634	$2,439,080
Depreciation and depletion	1,384,548	1,390,263
Operating income	$627,086	$1,048,817
Interest	646,806	692,465
Federal taxes	95,831	51,799
Net income	(d)$115,551	$304,553
Earned per share, pfd.	nil	$2.24
No. of preferred shares, 135,888.		

CONSOLIDATED BALANCE SHEET, AS OF JUNE 30	1931	1930
Assets:		
*Fixed assets	$23,671,313	$24,859,991
Current assets:		
Cash	2,423,124	1,899,218
Notes and accounts rec.	994,672	1,122,070
Short term securities	620,000	
Inventories	2,469,460	2,992,011
Miscellaneous investments	347,721	405,763
Insurance fund, etc.	186,919	138,920
Deferred charges	59,643	20,598
Total	$30,772,852	$31,438,571
Liabilities:		
Preferred stock	$13,588,800	$13,588,800
†Common stock	4,000,000	4,000,000
Gold bonds	10,487,000	11,135,000
Current liabilities:		
Accounts payable	227,043	242,956
Accruals	305,531	350,022
Federal tax reserve	103,899	95,274
Miscellaneous reserves	104,725	111,567
Surplus	1,955,854	1,914,952
Total	$30,772,852	$31,438,571
Current assets	$6,507,256	$6,013,299
Current liabilities	636,473	688,252
Working capital	$5,870,783	$5,325,047

*After depreciation and depletion. †Represented by 400,000 no par shares.

Riverside Cement Earnings

NET EARNINGS of Riverside Cement Co., Los Angeles, Calif., for the six months ended June 30, 1931, after allowing for all charges, were in excess of dividend requirements for the period on the company's 6% preferred stock, according to John Treanor, president.

The statement, which accompanied the current dividend payment of $1.50 a share, payable August 1, says in part:

"Although the operations of your company have necessarily been on a restricted scale during the last six months owing to the small volume of building construction . . . the dividend upon its first preferred stock for the first half of 1931 was earned, with a substantial margin, after setting up the usual reserves. . . . The management contemplates at least as good results for the second half of the year."

The company does not publish complete interim reports. In commenting upon the company's financial condition, however, Mr. Treanor told the *Wall Street Journal* that current assets are more than ten times current liabilities. Net working capital, he said, amounts to more than $2,500,000. Cash alone exceeds $900,000, he said.

Alpha Reports Earnings

ALPHA PORTLAND CEMENT CO. reports for 12 months ending June 30, 1931, net income of $546,583 after depreciation and federal taxes, equivalent, after 7% preferred dividend requirements, to 57c. a share on 711,000 no-par shares of common stock. This compares with $1,408,916 or $1.78 a share in 1930.

Consolidated income account for 12 months ended June 30, 1931, compares as follows:

	1931	1930
Net sales	$8,265,389	$10,797,831
Operating expenses	6,339,001	8,150,627
Depreciation	1,385,677	1,317,547
Operating profit	$ 540,711	$ 1,329,657
Other income (net)	151,671	248,985
Total income	$ 692,382	$ 1,578,642
Federal taxes	145,799	169,726
Net income	$ 546,583	$ 1,408,916
Preferred dividends	†105,000	*175,000
Common dividends	1,066,500	1,955,250
Deficit	$ 624,917	‡$721,334

*Includes five quarterly dividends. †Three quarterly dividends. ‡Surplus.

Earned surplus account follows: Earned surplus July 1, 1930, $3,923,957; add: Net income for 12 months ended June 30, 1931, $546,583; total earned surplus, $4,470,540; deduct: Preferred dividends, $105,000; common dividends, $1,066,500; additional depreciation for year 1928, $32,366; additional federal taxes for prior years, $200,000; adjustment of sack inventory to market value at December 31, 1930, $95,658; leaving earned surplus June 30, 1931, $2,971,016.

Consolidated balance sheet of Alpha Portland Cement Co. as of June 30, 1931, compares as follows:

ASSETS	1931	1930
*Property account	$20,426,268	$21,733,564
Cash	3,143,038	1,924,593
Call loans		
U. S. Goverment securities, etc.	3,079,950	3,864,975
Work funds and advertising	130,807	200,467
Accounts and notes receivable	885,812	957,115
Inventories	2,373,128	2,804,679
Miscellaneous investments	290,203	272,829
Deferred charges	178,335	146,027
Total	$30,507,541	$31,904,249
LIABILITIES		
Preferred stock	$ 2,000,000	$ 2,000,000
†Common stock	24,134,500	24,134,500
Accounts payable	269,520	436,049
Wages payable	38,920	74,759
Federal tax reserve, etc.	154,503	211,236
Dividends payable	177,750	390,500
Insurance and other reserves	761,332	733,248
Earned surplus	2,971,016	3,923,957
Total	$30,507,541	$31,904,249

*After depreciation, depletion, etc. †Represented by 711,000 no-par shares.

Arundel Corp. Earnings

FOR SIX MONTHS ended June 30, 1931, Arundel Corp., Baltimore, Md., reports net income of $1,127,020 after depreciation and taxes, comparing with $1,197,513 in first half of 1930.

June net income after depreciation and taxes was $255,914, against $345,774 in June, 1930. Current assets June 30 were $4,072,570 and current liabilities $350,919.

United States Gypsum Six Months Report

THE STATEMENT of operations of the United States Gypsum Co., Chicago, Ill., and subsidiary companies, has been issued with statement by Sewell L. Avery, president, which reads as follows: "The accompanying balance sheet and statement of earnings reflect the results of continued decline in building construction. No improvement is expected during the remainder of the year."

Balance sheet as of June 30 shows current assets of $18,572,108 and current liabilities of $1,622,736, compared with $16,170,760 and $1,448,929, respectively, a year earlier. Net working capital amounted to $16,949,372 against $14,549,143.

CONSOLIDATED PROFIT AND LOSS ACCOUNT FOR THE SIX-MONTH PERIODS ENDED JUNE 30, 1930 AND 1931

	1931	1930
Net profits on operations before provisions for depreciation, depletion and income taxes	$3,448,595.95	$4,151,733.56
Other profits and income	397,866.88	287,589.43
Total	$3,846,462.83	$4,439,322.99
Deductions from income	174,963.99	96,219.41
Net profits from all sources before provisions for depreciation, depletion and income taxes	$3,671,498.84	$4,343,103.58
Deduct—Provisions for Depreciation and depletion	$1,126,681.11	$1,055,152.22
Income taxes	303,257.50	396,201.29
Total	$1,429,938.61	$1,451,353.51
Net profits	$2,241,560.23	$2,891,750.07
Net income on common stock, per share	$ 1.62	$ 2.24

SUMMARY OF CONSOLIDATED SURPLUS ACCOUNTS FOR THE SIX-MONTH PERIODS ENDED JUNE 30, 1930 AND 1931

Paid-in surplus	1931	1930
Balance at beginning of period	$ 6,378,248.14	$ 4,844,232.64
Surplus credits resulting from issuance of stock	118,153.29	697,209.71
Balance at end of period	$ 6,496,401.43	$ 5,541,442.35
Earned surplus:		
Balance at beginning of period	$28,235,563.35	$25,840,531.78
Add—Net profits for six months	2,241,560.23	2,891,750.07
Total	$30,477,123.58	$28,732,281.85
Deduct — Cash dividends		
On preferred stock	$ 274,459.50	$ 269,209.50
On common stock	973,267.20	928,708.80
Total	$ 1,247,726.70	$ 1,197,918.30
Balance at end of period	$29,229,396.88	$27,534,363.55

American Concrete and Steel Pipe Co. Sells Stock

M. H. LEWIS AND CO. is offering $1,000,000 of $25 par 8% convertible participating preferred stock of American Concrete and Steel Pipe Co., a Delaware corporation with plants at Los Angeles, San Diego and Oakland, Cal.; Tacoma, Wash.; Phoenix, Ariz.; Salt Lake City, Utah; Fort Worth and Dallas, Tex., at par. Upon completion of this financing the capitalization of the company will consist of $1,000,000 of preferred stock out of an authorized $1,500,000 and 65,000 shares of common.

The preferred is convertible, share for share, into common on any dividend date. It is entitled to $25 a share in event of liquidation and shares equally as a class with the common after dividends of $2 a share have been paid on preferred and common.

Officers and directors of the company are W. A. Johnson, president; E. F. Bent, executive vice-president; J. M. MacAdam and H. H. Jenkins, vice-presidents; G. F. Hyatt, secretary and treasurer.

Material Service Reports for Six Months

MATERIAL SERVICE CORP., Chicago, Ill., reports earnings for the first six months of this year were approximately $130,000 after charges including depreciation and interest but before federal taxes as compared with no profits in the like period of last year, according to Henry Crown, president. Earnings in July were larger than in any preceding month this year, and indications are that the profits for 1931 should compare favorably with last year, he said. For the year ended December 31, 1930, the company reported a net income after all charges of $265,040, or $2.12 a share on 125,000 shares of stock.

Directors of the Material Service Corp. have taken no action on the quarterly dividend of 50c. a share due at this time.—*Chicago* (Ill.) *Journal of Commerce.*

Asbestos Corp. of Canada

FIRST MORTGAGE bondholders of Asbestos Corp. of Canada, Ltd., subsidiary of Asbestos Corp., will meet August 21 to vote on cancellation of bonds purchased or called for sinking fund. Only a small amount of the bonds remains outstanding.

As an alternative, approval is asked for postponement of interest due July 1, 1931, January 1 and July 1, 1932, to January 1, 1933; also postponement of sinking fund installment due January 1, 1932, for one year.

Warner Co. Reports Earnings

WARNER CO., Philadelphia, Penn., reports for the six months ended June 30, 1931, net income of $165,954, after depreciation and federal taxes.

A comparative statement of six months' earnings for 1930 and 1931 follows:

6 months ended June 30	1931	1930
Net earnings after depreciation and depletion	$412,213	$740,394
Net after all prior charges applicable to preferred stocks	165,954	*343,154

*After preferred dividends, available for common dividends.

Certain-teed Reports for Six Months

CERTAIN-TEED PRODUCTS CORP., New York, N. Y., and subsidiaries report for quarter ended June 30, 1931, net profit was $33,268 after charges and taxes equal to 53 c. a share on 63,004 shares of 7% preferred stock on which there is an accumulation of unpaid dividends. This compares with net loss of $233,892 in preceding quarter and net loss of $206,374 in June quarter of 1930.

Consolidated income account for six months ended June 30, 1931, compares as follows:

	1931	1930
Gross profit after depreciation and depletion	$1,717,940	$1,683,171
Other income	53,197	51,923
Total income	$1,771,137	$1,915,094
Cost, expenses and book interest	1,608,698	2,301,632
Bond interest	341,308	355,265
Federal tax	8,575	11,706
Sundry adjustment	†13,180	3,429
Net loss	$200,624	$756,938

†Credit.

Consolidated balance sheet of Certain-teed Products Corp. and subsidiaries as of June 30, 1931, compares as follows:

ASSETS

	1931	1930
*Land, buildings, machinery and equity	$12,034,510	$19,873,512
Water power rights	1	644,857
‡Gypsum deposits	3,537,772	3,569,479
Timber lands	903,753	903,753
Goodwill, trademark, etc.	1	1
Cash	2,929,600	1,619,709
Accounts and notes receivable	3,080,127	3,928,235
Notes receivable (not current)	24,139	.....
Inventories	3,106,635	4,795,542
Advanced to trustee	.....	815,867
Debentures in treasury	22,879	.....
Abandoned plants	332,558	.....
Inventories in and advances to subsidiaries	278,974	530,157
Other investments	217,458	232,965
Prepaid expenses	313,540	547,083
Total	$26,781,947	$37,461,160

LIABILITIES

7% preferred stock	$6,300,400	$6,302,430
Common stock	†5,734,500	17,370,000
Minority stock interest	400	400
Debenture bonds	12,067,000	12,900,500
Notes payable	.....	.....
Accounts payable	616,360	646,737
Accrued federal tax	64,265	64,589
Accrued bond interest	220,672	235,841
Reserve for federal tax	8,575	11,706
Appropriated surplus	250,000	.....
Capital surplus	642,910	1,414,644
Deficit	.....	1,485,687
Earned surplus	876,865	.....
Total	$26,781,947	$37,461,160

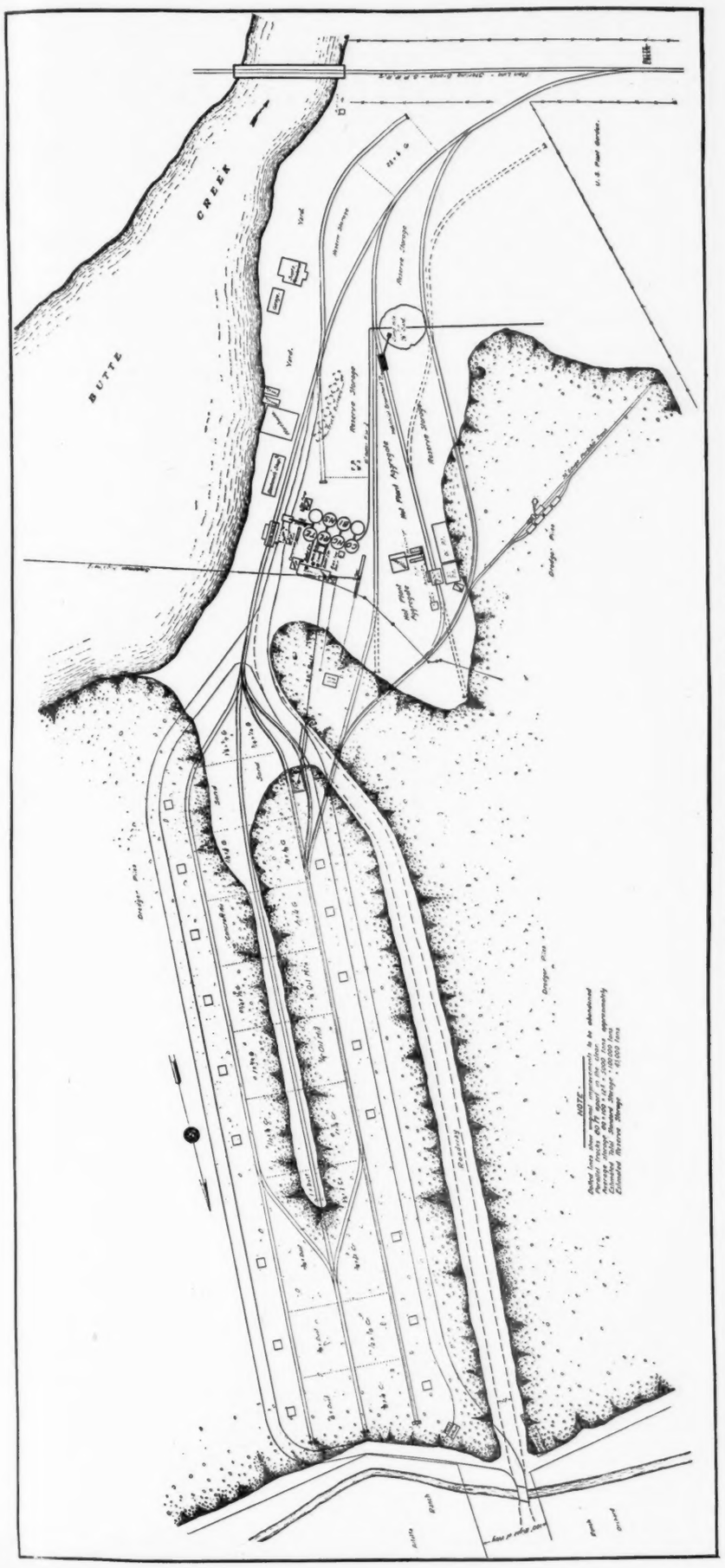
*After depreciation. ‡After depletion. †Represented by 382,300 no-par shares.

Cement Company to Purchase Own Stock

THE stockholders of the Missouri Portland Cement Co., St. Louis, Mo., on July 24, 1931, approved a proposal to broaden charter powers of the company so as to permit the purchase of its own stock on two-thirds vote of members of the board.

Recent Dividends Announced

Johns-Manville Corp. com. (qu.)	$0.75	Oct. 15	
Johns-Manville Corp. pfd. (qu.)	1.75	Oct. 1	
National Gypsum Co. pfd.	1.75	Oct. 1	
Superior Portland Cement Cl. A. (mo.)	.27½	Sept. 1	



Layout of plant of Johnston Rock Co., Chico, Calif.

New California Plant

THE JOHNSTON ROCK CO., Chico, Calif., has a new crushed rock plant not far from Chico on Butte creek. A plant in operation since 1928 was replaced by this new plant. The capacity of the new plant is 1500 tons per day.

The accompanying illustration shows the plant layout. Cobbles, gravel and sand from the old dredger piles which furnish the material will be delivered to a concrete pit where a grizzly with 12-in. spaces will reject oversize and everything else will pass on to a 30-in. belt conveyor 310 ft. long, which will deliver to a scalping screen 28 ft. long.

This will separate sand and various sizes of pea gravel to 2½ in. The oversize will pass to Symonds and Blake crushers and to revolving and vibrating screens, the crushed rock products ranging up to 2½-in. in size. Besides bunker storage, stockpiles are maintained. A Brownhoist crane is used for this work and for loading railroad cars.

This description and the layout of the plant were given in the last quarterly report of the Division of Mines in the Department of Natural Resources of California.

Handbook of Scraper Mucking

AN INTERESTING HANDBOOK on the use of scrapers has been prepared and published by the Sullivan Machinery Co., Chicago, Ill.

The first section deals with the general principles of scraper mucking and the second section contains descriptive matter taken from published articles on different installations. The various applications of scrapers to mining and underground work as well as surface work are covered and full data given on the operating results and costs of specific installations. Scraper design, as well as details of other equipment and accessories, is also discussed in the various chapters.

This publication is identified as No. 176, contains 118 pages and is divided into 16 chapters.

Hearing on Feldspar Tariff

PUBLIC NOTICE of the hearing by the United States Tariff Commission under the provisions of Section 336 of Title III of the tariff act of 1930, investigation No. 63 by the United States Tariff Commission for the purposes of Section 336 of the tariff act of 1930, on feldspar has been issued. A public hearing in the foregoing investigation will be held at the office of the United States Tariff Commission in Washington, D. C., at 10 a. m., September 17, 1931, at which time and place all parties interested will be given opportunity to be present, to produce evidence, and to be heard with regard to the differences in costs of production of, and of all other facts and conditions with respect to feldspar, crude and ground.

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of August 1:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

23173. **Crushed stone** (trap rock), (See Note B), from Westfield to Chester, Mass. Present rate, 60c per net ton; proposed, 50c. (To expire December 31, 1931.) Reason—To establish commodity rate to meet motor truck from local crusher.

23193. **Stone,** broken or crushed, in bulk, in gondola and other open-top cars (See Note B), from West Quincy, Mass., to Foxboro, Mass. Present rate, 95c per net ton; proposed, 50c. (See Note A.)

23202. **Dust, stone,** in bags, minimum weight 60,000 lb., from Westfield, Mass., to Hartford, Conn. Present rate, 12c; proposed, $1.50 per net ton.

23206. **Stone, broken or crushed,** in bulk, in gondola or other open-top cars (See Note B), from West Quincy, Mass., to Needham, Mass. Present rate, 90c per net ton; proposed, 50c. (See Note A.)

TRUNK LINE ASSOCIATION DOCKET

27436. **Gravel and sand** (other than blast, engine, foundry, glass, molding or silica, carloads, minimum weight 90% of marked capacity of car, from Portland, Penn., to Columbia, N. J., 35c per net ton. Present rate, 45c.

27437. **Screenings, crushed stone; stone, crushed; tailings, crushed stone;** carloads, minimum weight 90% of marked capacity of car, from LeRoy and Lime Rock, N. Y., to Warsaw, N. Y., 65c per net ton. Present rate, 75c. (See Note A.)

27445. Cancel D. L. & W. R. R., I. C. C. No. 20940, covering rates on **limestone,** carloads, from Nazareth, Penn., to Catasauqua, Northampton, Siegfried, Penn., and Vulcanite, N. J., classification basis to apply. Reason—Siding to the quarry has been removed and no further movement of limestone is contemplated. Therefore rates are obsolete.

27448. Cancel commodity rates of 88c per net ton on **limestone,** carloads, from Allentown, Penn., to Lehigh Valley R. R. stations, Lower Lehighton, Penn., to Lehighton, Penn., inclusive, also rate of $1.26 per net ton from Auburn, N. Y., to Lehigh Valley R. R. stations, Owego, N. Y., to Dryden, N. Y., inclusive, classification basis to apply. Reason—Investigation develops there has been no movement for some time and there is no prospect of future movement. Therefore rates are obsolete.

27453. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand), **and gravel,** carloads, minimum weight 90% of marked capacity of car, from Boonville, N. Y., to Prospect Jct., N. Y., 65c; Trenton Chasm, N. Y., 65c; Gravesville, N. Y., 65c; Poland, N. Y., 65c; Newport, N. Y., 65c; Middleville, N. Y., 65c; County Home, N. Y., 65c; Kast Bridge, N. Y., 75c, and Herkimer, N. Y., 75c per net ton. Rate to expire December 31, 1931. (See Note A.)

27454. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand), **and gravel,** carloads, minimum weight 80,000 lb., from Boonville, N. Y., to Inghams, Dolgeville and Salisbury Centre. (See Note A.)

27456. To establish the following switching rate on **sand and gravel:** From siding of the Lycoming Silica Sand Co., Siding of Eck Bros., at Montoursville, Penn., to Bird's Siding at Montoursville, Penn. Rate per car, $6.75. Present rate, 38c per 2000 lb. (See Note A.)

27462. **Sand and gravel,** carloads, minimum weight 90% of marked capacity of car, from Farmingdale, N. J., to Oceanport, N. J., 50c per net ton. (See Note A.)

27463. **Gravel,** carloads, in open-top equipment, minimum weight 90% of marked capacity of car, from Pinewald, N. J., to Plainfield, N. J., 80c per net ton. (See Note A.)

27467. **Burnt or refuse foundry sand,** carloads, minimum weight 60,000 lb., from Buffalo and Black Rock, N. Y., to Toronto, Ont., $1.80 per net ton. Reason—Proposed rate is comparable with rate from Black Rock, N. Y., to Ingersoll, Ont.

27469. **Sand and gravel,** carloads, minimum weight 90% of marked capacity of car, from Farmingdale, N. J., to Lakehurst, N. J., 60c per net ton. Rate to expire April 30, 1932. (See Note A.)

27470. **Sand,** carloads, minimum weight 90% of marked capacity of car, from Kenvil and Hopatcong Jct., N. J., to Plainfield, N. J., 70c per net ton. (See Note A.)

CENTRAL FREIGHT ASSOCIATION DOCKET

29058. To establish on **agricultural limestone** in box cars, minimum weight 50,000 lb., Woodville to Gibsonburg, O., to Earning, W. Va., 347c per net ton. Present rate, 477c.

29070. To establish on **sand (bank, river and/or torpedo),** carloads, from Dickason Sand Pit (located in the switching limits of Cayuga, Ind.), to Brooks, Ind. (a local point on the C. A. & S. R. R.), rate of 90c per net ton. Present rate, 208c, constructed 127c to State Line Jct., Ill.-Ind., and 81c beyond.

29073. To cancel various commodity rates published in N. Y. C. & St. L. R. R. Tariffs to the extent as indicated below, allowing classification basis to apply:

Crushed stone, crushed stone screenings, limestone, etc., from Erie, Penn., Painesville, O., Fostoria, O., Oakwood, O., Ft. Wayne, Ind., South Gary, Ind., as published on pages 42 to 53, inclusive, of N. Y. C. & St. L. G. F. D. 584-G.

Agricultural limestone, from Erie, Penn., as published on pages 56 to 58, inclusive, of N. Y. C. & St. L. G. F. D. 584-G.

Agricultural limestone, from Castalia, O., to Erie, Penn., as published in N. Y. C. & St. L. G. F. D. No. 952.

Crushed stone, agricultural limestone, etc., from Muncie, Ind. (all rates), as published on pages 17 to 26, inclusive, of N. Y. C. & St. L. G. F. D. 951.

Note A—Reason—To meet motor truck competition.

Note B—Minimum weight 90% of marked capacity of car, except that when car is loaded to full visible capacity the actual weight will apply.

Agricultural limestone, from Castalia, O., Muncie, Ind., and Sandusky, O., as published on pages 19 to 26 of N. Y. C. & St. L. G. F. D. 951.

29083. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel,** carloads, from Leeland, Ind., to Gravelton, Ind., rate of 50c per ton, to expire with October 31, 1931. Present rate, 60c.

29084. To establish on **sand and gravel,** carloads, from Attica, Ind., to Taylorville, Ill., present 90c, proposed 80c; from Attica, Ind., to Clarksdale, Palmer, Morrisonville, Harvel and Raymond, Ill., present 90c, proposed 85c; from Lafayette, Ind., to Taylorville, Ill., present 100c, proposed 90c; from Lafayette, Ind., to Clarksdale, Palmer, Morrisonville, Harvel and Raymond, Ill., present 100c, proposed 95c. Route: Wabash direct. (Rates in cents per net ton.)

29085. To establish on **sand and gravel,** in straight or mixed carloads, from R A Junction, O., and Sturm & Dillard Siding, O., to points on C. & O. Ry., main line and branches, Crane, Va., to Cotton Hill, W. Va., both inclusive. (Rates in cents per net ton.)

Over 170 mi. and not exceeding 175 mi., 130c; over 175 mi. and not exceeding 200 mi., 140c; over 200 mi. and not exceeding 225 mi., 150c; over 225 mi. and not exceeding 250 mi., 160c; over 250 mi. and not exceeding 280 mi., 175c; over 280 mi. and not exceeding 290 mi., 185c; over 290 mi. and not exceeding 320 mi., 195c; over 320 mi. and not exceeding 355 mi., 205c. Present rates, class.

29098. To establish on **crushed stone,** carloads (See Note B), from Bascom, O. (rates in cents per net ton):

To	Miles	—Rates— Pres.	Prop.	P.S.M. 923
Willard, O.	28	60	50	70
Sullivan, O.	56	80	70	90
Cleveland, O.	124	90	80	115
New Haven, O.	31	60	50	75

29113. To establish on **sand and gravel** in open-top cars, carloads (rates in cents per net ton): From Sargents, O., to Pedro, O., present 90c, *proposed 70c. Route—Via N. & W. Ry., Ironton, O., and D. T. & I. R. R.

*Proposed rate to expire with December 31, 1931.

WESTERN TRUNK LINE DOCKET

Sup. 1 to 7633. **Stone, crushed, rubble,** etc., from Fort Madison, Ia., to Omaha, Neb. Please refer to Docket Bulletin No. 2987, dated June 2, 1931, Docket No. 7633. This subject has now been canceled from the docket.

SOUTHWESTERN FREIGHT BUREAU DOCKET

23334. **Phosphate rock,** from Gulf ports to St. Louis, Mo., East St. Louis, Ill., and Memphis, Tenn. To establish on phosphate rock, description and minimum weight as per Item 46229, Agent Emerson's Tariff I. C. C. 157, from Gulf ports, Pensacola, Fla., to New Orleans, La., a rate of 377c to St. Louis, Mo., and East St. Louis, Ill., and 243c per ton of 2240 lb. to Memphis, Tenn. It is proposed to apply this traffic via routes that are used between the stations via lines involved on other traffic, and proponent sees no objections to establishing these routes on phosphate rock.

23338. **Sand,** from Chippewa Falls, Wis., to points in Kansas and Missouri. To establish a rate of 23c per 100 lb. on sand, carloads, description and minimum weights as per Item 6000-A, W. T. L. Tariff 18-M, from Chippewa Falls, Wis., to points in Kansas and Missouri as shown in Item 6000-A. Proponent feels that the present rate is too high in comparison with that from other origins and it is not feasible to increase the latter. There is in effect commodity rate of 23c from Chippewa Falls and Eau Claire to St. Joseph, which was recommended under Docket No. 6729-A for application to Independence, Mo., and it is felt that the rate to Joplin District and the Kansas City Gas Belt should not be less.

I. C. C. Decisions

17000. Sand and Gravel. The Interstate Commerce Commission, in part 11-A, Hoch-Smith rates on sand, gravel and crushed stone, from and to points in Kansas and Missouri, has extended into the states mentioned the sand and gravel scale prevailing in the southwest. Rates in conformity with that scale are to be made effective not later than October 15. This report also embraces No. 17000, another Hoch-Smith proceeding, on further hearing, as to the rates on silica sand. A scale has also been provided in that case to be used in making rates on silica sand.

The report, written by Commissioner Lewis, is summarized into nine propositions, each pertaining to some phase of the subject. A general statement in respect of the nine propositions is that the southwestern scale is extended into Kansas and the whole of Missouri. The northern part of that state is outside of the southwestern territory.

In part 11, sand, gravel, crushed stone and shells, the commission prescribed a basis of maximum reasonable single-line and joint-line interstate rates on the commodities mentioned in the title for application in straight or mixed carloads between points in Arkansas, Oklahoma, Texas and Louisiana west of the Mississippi river, but including crossings on the east bank of the river between New Orleans, La., to Memphis, Tenn., both inclusive. That proceeding was conducted cooperatively and resulted in the creation of the scale which has been referred to as the southwestern revision scale. Due to the meager evidence in that proceeding dealing with rates on silica sand it was held open for further hearing respecting rates on that commodity. Such further hearing was had in conjunction with those in the title proceedings, No. 17000, part 11-A.

The commission found as to the general level of rates that the interstate rates maintained by the respondents in No. 17000, part 11-A, in straight or mixed carloads between

points in Missouri, between points in Kansas, between points in Missouri and Kansas and between points in Missouri and Kansas, on the one hand, and points in Oklahoma and Arkansas, on the other hand, were, and for the future would be, unreasonable to the extent that they exceed, or may exceed, the rates set forth in appendix 2 (not herein reproduced but summarized) except as otherwise provided by subsequent findings.

A further finding was that the interstate rates on silica sand, in box cars, maintained by the respondents in No. 17000, part 11-A, between points in Missouri, between points in Kansas, between points in Missouri and Kansas and between points in Missouri and Kansas, on the one hand, and points in Oklahoma and Arkansas, on the other, and the interstate rates maintained on the same commodity, in box cars, by respondents in No. 17000, part 11, as between points in Arkansas, Oklahoma, Texas and western Louisiana, were, and for the future would be, unreasonable to the extent they exceed, or may exceed, the rates set forth in appendix 3 (not herein reproduced but summarized).

A third finding is that the interstate rates maintained in No. 17000, part 11, on silica sand, in open-top cars, between points in Arkansas, Oklahoma, Texas and western Louisiana, are, and for the future will be, unreasonable to the extent that they exceed, or may exceed, the rates prescribed in the appendix 2 scale.

A fourth finding is that the interstate rates maintained by the carriers in No. 17000, part 11, on silica sand, between points in Arkansas, Oklahoma, Texas and western Louisiana, on the one hand, and Memphis, Tenn., Vicksburg and Natchez, Miss., and Angola, Baton Rouge, Harahan and New Orleans, La., on the other, are, and for the future will be, unreasonable to the extent they exceed, or may exceed, the following basis: In box cars, the rates set forth in appendix 3, plus 7c a net ton when to or from Memphis, and plus 9c a net ton when to or from the other named east-bank Mississippi river crossings; in open-top cars, the rates set forth in appendix 2, plus 6c a net ton when to or from Memphis, and plus 8c a net ton when to or from the other named east-bank crossings.

The fifth finding is that the interstate rates covered by No. 17000, part 11-A, on crushed stone, gravel and sand, in straight or mixed carloads, from all points within Missouri and Kansas, located within a distance by air line of 15 mi. from the passenger station of the Kansas City Terminal Railway Co. at Kansas City, Mo., to industrial and team truck deliveries within the Kansas City, Mo.-Kan., switching district, are, and for the future will be, unreasonable to the extent they exceed, or may exceed, a rate of 55c a net ton.

The sixth finding is that the interstate rates maintained by the carries in No. 17000, part 11-A, on crushed stone, gravel and sand, in straight or mixed carloads, from the same points as defined in the fifth finding to destinations in Kansas and Missouri other than those within the Kansas City switching district and to destinations in Oklahoma and Arkansas, are, and for the future will be, unreasonable to the extent they exceed, or may exceed, the rates established from Kansas City, Mo.-Kan., on the same commodities to the same destinations through the application of the scale set forth in appendix 2.

In dealing with rates from points within and adjacent to the Tulsa, Okla., switching district, also from Sand Springs, Okla., to points in Missouri and Kansas, the commission made its seventh finding to the effect that the rates maintained by the respondents in No. 17000, part 11-A, on sand, from Kengle, Price, Gray, Shirk and Joe Station, Okla., also on crushed stone, from Price, Gray, Weertz and Garnett, Okla., to destinations in Kansas and Missouri, are, and for the future will be, unreasonable to the extent that they exceed, or may exceed, the rates from Tulsa on sand and crushed stone to the same destinations through the application of the scale set forth in appendix 2.

The eighth finding is that the minimum weight shall be 90% of the marked capacity of the car, except that when the car is loaded to full visible capacity the actual weight shall govern.

The ninth finding is the one laying the rule for determining whether hauls are single-line or joint-line for the purpose of applying the scale of appendix 2. The rule is that where the carriers are under common control or management they shall be deemed single-line haul; otherwise, joint lines. The finding also contains the rule for computing distances without transfer of lading. In computing distances for the application of the rates in appendix 3 the findings said the shortest routes shall be used over which carload traffic can be moved without transfer of lading.

Such carriers as might desire fourth section relief, the commission said, should at the proper time file appropriate applications for such relief.

As to intrastate rates, the commission said the basis of rates approved for interstate application were likewise being approved by the Missouri and Kansas commissions, respectively, for intrastate application within each of those states. Likewise the Arkansas, Oklahoma and Texas commissions were, respectively, approving for intrastate application within those states the interstate basis of rates prescribed herein on silica sand.

Commissioner Eastman, concurring in part, said that he preferred the scale prescribed in McGrath Sand and Gravel Co. vs. A. T. & S. F., 165 I. C. C. 454, to the one which the commission prescribed in this case. He said that it was now proposed to apply the southwestern scales within all of Missouri, including the northern half. If that was done, he said, it seemed unlikely that the scales prescribed in the McGrath scales from the Missouri points in Iowa could stand up, for there was no reason why rates should be higher there than in the territory immediately to the south.

"And, once the movement is started," said Mr. Eastman, "the southwestern scales seemed destined to spread throughout western trunk line territory, over into Illinois and then throughout central territory. This, I believe, would be unfortunate."

He said if the extension of the McGrath scale should cause indefensible inconsistencies in comparison with the southwestern scales, it was the latter which should be corrected.

Commissioner Porter, dissenting, said that the description of the rate situation contained in this report as applied on sand, gravel and crushed stone throughout the country was convincing to him that the rates prescribed in sand, gravel, crushed stone and shells, 155 I. C. C. 247, for application in the southwest, were "far below maximum reasonable rates."

"All things considered," said Mr. Porter, "it is the lowest scale of its kind prescribed by us anywhere in the country. Its single-line rates average only 6.55% of the southwestern first class rates, and the average of both the single-line and joint-line rates is only 7.07%. The majority are here extending this low scale of rates into two more states for both intrastate and interstate application, which further aggravates an already bad situation. The rates are even lower than many of the intrastate rates which have heretofore prevailed in those states.

"After we have extended this scale of rates as is here done, it logically follows that we must eventually prescribe the same or an even lower scale throughout western trunk line, official and southern territories, thus replacing in those lower-rated territories rates on these commodities which are now actually or relatively higher, and many of which have been prescribed by us."

The appendix scale 2 for single-line haul begins with 50c a ton for the initial block of 10 mi. or under, goes to 74c for 50 mi. and over 40; becomes 100c at 100 mi.; 150c at 200 mi.; 190c between 290 and 320 mi.; 220c between 380 and 410 mi.; 250c at 500 mi.; 290c between 590 and 620 mi.; 320c between 680 and 710 mi., and runs out with a rate of 350c for the block between 770 and 800 mi. The joint-line scale begins with 65c for the initial block; becomes 89c at 50 mi.; 115c at 100 mi.; 160c at 200 mi.; 200c between 290 and 320 mi.; 225c between 380 and 410 mi.; 250c at 500 mi.; 290c between 590 and 620 mi.; 320 between 680 and 710 mi., and runs out with a rate of 350c for the block between 770 and 800 mi.

The scale in appendix 3 for application on silica sand, in box cars, applies to both single and joint line hauls. It begins with a rate of 64c a ton for the initial block of 10 mi. and under; becomes 96c at 50 mi.; 130c at 100 mi.; 183c at 200 mi.; 230c between 390 and 320 mi.; 263c between 380 and 410 mi.; becomes 292c at 500 miles; 324c between 590 and 620 mi.; 348c between 680 and 710 mi.; 372c between 770 and 800 mi.; 395c for 900 mi., and runs out with a rate of 415c for 1000 mi.

15806. **Cement.** Florida intrastate rates on cement have been condemned as unduly prejudicial to the complainant and intervenors at Birmingham, Ala., and other producing points outside of Florida and unduly preferential of shippers at Jacksonville, Miami, Tampa and Pensacola, Fla., in No. 15806, Lehigh Portland Cement Co. vs. A. & R. et al. The undue prejudice is to be removed not later than October 15.

This finding of undue prejudice was made in a fourth supplemental report, on further hearing, written by Commissioner Eastman. Other prior reports were made in 139 I. C. C. 484, 147 I. C. C. 303 and 155 I. C. C. 339. The commission, in this report, affirmed the findings in the original report, 132 I. C. C. 427, in which it prescribed maximum reasonable rates in interstate and foreign commerce to destinations in interstate commerce.

When the original report was made the carriers applied to the Florida commission for permission to establish the new basis of rates on intrastate traffic. That basis provided for arbitraries in the peninsula of Florida. The Florida commission allowed arbitraries only for short and weak lines. The result, Commissioner Eastman said, was that rates on cement between points in Florida were the same as between other points in southern territory, but that the rates from producing points outside of the state to the peninsula were higher than the basic scale by the amounts of the arbitraries, while on intrastate traffic the inflation caused by the arbitraries on interstate rates was not present. While the case was going on a cement mill was built at Tampa and the intrastate rates from it allowed by the Florida commission did not reflect the arbitraries in the rates from mills outside of the state.

23180. Lime. Case dismissed between Washington Building Lime Co. vs. Arcade and Attica et al. The commission found lime rates from Engle, W. Va., to destinations in trunk line territory and in eastern Ohio not unreasonable or otherwise unlawful.

No. 23213. **Oyster Shells.** Ralston Purina Co., Inc., vs. A. B. & C., et al. Rates assailed on oyster shells, less than carloads, from Nashville, Tenn., to numerous interstate destinations in southern territory, except those assessed on the shipments which moved to destinations to which specific less-than-carload rates were published, were applicable, and rates assailed were unreasonable to extent they exceeded rates based on 130% of the carload rates contemporaneously in effect on this traffic between the same points. Complainant entitled to reparation to basis of rates found applicable and reasonable. Waiver of outstanding undercharges authorized.

23650. **Trap rock and sand.** R. E. Weber v. Boston and Albany railroad; rates on trap rock, in carloads, from Westfield, Mass., to Millerton and Wingdale, N. Y., and on common sand, in carloads, from North Wilbraham, Mass., to the same destinations, found not unreasonable. Complaint dismissed.

Intervenes in Freight Rate Investigation

THE National Sand and Gravel Association has filed notice with the Interstate Commerce Commission of its intention to participate, on behalf of the sand and gravel industry in general, in the investigation now being conducted as the result of the application of Class 1 railroads for a horizontal increase of 15% in rates on all freight traffic. Decision to take this step was taken by President Potts after a survey had been conducted by the association for the purpose of determining the general sentiment within the industry toward the proposal of the carriers. This survey developed that the board of directors was unanimously of the opinion that further increases in rates on sand and gravel would divert a larger volume of sand and gravel traffic to truck and water transportation and, as one result, would injure rather than benefit the revenues of the carriers.

The association has retained counsel to speak for the sand and gravel industry in the proceedings before the Interstate Commerce Commission. Announcement will be made later concerning the definite date assigned for hearing the testimony of this industry. Tentative plans are that three or four producers, representing various parts of the country, will appear as witnesses. In its essential terms, the policy formulated by the board of directors contemplates that the association will represent the sand and gravel industry on this basis: that it is sympathetically interested in the efforts of the carriers to improve their financial standing, but that the industry is not able to absorb higher freight charges. Stated another way, it is prepared to prove that the transportation characteristics of our materials are such that a 15% increase in rates will have the inevitable consequence of a further decline in sand and gravel carloadings.

There was reason to hope that the carriers would indicate their willingness to specifically exempt sand and gravel from their appeal for increased rates. But in answer to an order from the commission directing them to enumerate the particular commodities to which they did not intend to apply the increases, the carriers stated that "it is not proposed to make any specific exemption on any commodities."

In other words, the carriers would like to have the commission give them blanket authority to increase all freight rates by 15%, leaving to the discretion of the individual railroad companies the question as to whether exceptions should be made in the case of any commodity. Of course, this would mean that in the case of sand and gravel rates, for instance, they might decide not only to refrain from adding to the measure of the existing rates, but actually to make reductions in order to meet truck and water competition. But their decision not to commit themselves as to prior exemptions forces the association to introduce into the record full information concerning sand and gravel traffic.—*National Sand and Gravel Bulletin.*

Nebraska Gravel Rate Hearing

RAILROAD MEN, gravel producers, members of the state railway commission and legal talent representing all three groups were still grinding away July 15 over the tangled problems involved in an effort at readjustment of Nebraska gravel rates.

Controversy over the rate structure had settled largely to dispute over two issues, absorption of switching charges and horizontal rate reductions.

Railroads were asked to show cause why general reduction should not be ordered. They are resisting any general reduction and are also resisting possibility of an order to absorb switching charges at the lower emergency rates established for specific points.

All gravel producers except the Lyman-Richey Sand and Gravel Co. are contending for the absorption of switching charges, preferring the higher rates unless this charge is absorbed. They contend its elimination destroys competition.—*Lincoln* (Neb.) *Star.*

Beg Your Pardon

AN ERROR was made in reporting the type of compressor in use in a portable drilling outfit by the Georgia Limerock Co. near Perry, Ga., in the Helps and Hints department of the July 18 issue of Rock Products.

In the article a portable self-contained drilling outfit was described and we are grateful to Schramm, Inc., West Chester, Penn., for advising that its compressor was used in building this drill.

	1923
Number of establishments	45
Short tons	25,549
Value	$4,992,373

To Develop Silica Sand Deposit Recently Discovered

WHILE OPERATING a building stone quarry near Uvalde, Tex., the Uvalde Sand and Stone Co. discovered a deposit of high grade silica sand which is to be commercialized on a large scale. The first knowledge of the existence of the deposit was obtained during the construction of a highway through this section. Tests which have been made of the sand at the laboratory in Austin which is operated jointly by the Engineering Research Department of the University of Texas and the State Highway Department show the material to be of especially high tensile strength.

More Facts on Output of Carbon Dioxide Ice

IN THE JULY 18 ISSUE, page 41, of Rock Products information was published on the Output of Carbon Dioxide Ice Since 1927 in which article general information was included on this product. Additional information has now been supplied on this subject by C. C. Concannon, chief of the Chemical Division of the Department of Commerce.

Sources of this material not included in the original information are magnesite and dolomite. Additional uses of the gas are in the food products industries (baking, ripening and storage of fruits, dairy products, canning, beverages), mechanical uses (spray painting, railway signals, cleaning plumbing, torpedo motive power and explosive); low temperature (mechanical refrigeration, medical practice, chemical industries, fire prevention and extinction). The largest use of the solid product is for the transportation of ice cream. Other applications of solid carbon dioxide, according to trade authorities, include the use for temperature control in dough mixing in commercial bakeries, transportation of meat, fish, cheese, milk and, in some instances, fruits, vegetables and flowers.

In discussing the uses of solid carbon dioxide for shipments of perishables, Dr. Charles Brooks of the Bureau of Plant Industry has stated, "It is largely a question of tolerance of the particular fruit or vegetable to the accumulation of carbon dioxide in the storage air. This tolerance varies with the variety and maturity of the product. However, methods of refrigerating perishables in transit by use of a solid carbon dioxide are being developed which obviate exposure to carbon dioxide gas thereby correcting this difficulty and making possible shipment of all perishables.

The Bureau of the Census reports commercial production of carbon dioxide (liquid and solid) in the United States as follows:

1925	1927	1929
44	49	....
29,860	37,132	57,235
$5,128,441	$6,048,474	$6,637,349

Ed. Shaw's News Letter From Los Angeles

THE COURTS have decided that the $22,000,000 originally appropriated for the San Gabriel dam may be expended for any other flood control work. Fifteen minutes after the decision was received, Flood Control Engineer Eaton had started a party of men making surveys and doing other preliminary work. He is quoted as saying that 2000 men will be at work within six months. How much the rock products industry will benefit cannot be determined at the present time, although it is certain that a lot of concrete will be poured before this money is spent. There are to be built two earth fill dams with concrete cores and a 250-ft. concrete arch dam beside other works for which concrete will be required. Aggregate producers may or may not benefit, for it is probable that bids will be asked for three ways, the contractor furnishing aggregate from his own plants, the county furnishing the aggregate and the contractor buying the aggregate from commercial companies.

The decision of the court involved a question that might come up anywhere that funds are appropriated for public works, the right to divert from the original plan to another. It is my recollection that courts have usually been pretty strict about this, sometimes going much farther than justice demanded, refusing to pay for work where changes were made, even though it was shown that such changes were necessary for the stability and safety of the structure.

In this case the courts used good, common sense. Originally $25,000,000 was appropriated for a large dam 450 ft. high. A lot of work was done on the dam site and this developed that the rock on which the dam would rest was badly faulted and that it would probably be unsafe for so large and heavy a structure with such a great depth of water behind it. Plans had to be changed and it was a question if the money could be spent for the changed plans. A friendly suit was started and the Supreme Court gave a decision which was to the effect that money appropriated for improvements on a certain stream could be spent anywhere in the watershed, provided, of course, that the original intention was carried out. It has happened here before that money appropriated for a part of some work was more than enough to complete it and the courts have held that what was left over could be spent on the remainder of the work.

The public, of course, does not care whether there is one dam or three, but it does want to prevent another disastrous flood. There have been two of these in the past 25 years. Since the last, the city has grown considerably in the regions which might be most affected and it is estimated that $150,000,000 in property would be endangered if another flood came. In addition the dams will add considerably to the city and county water supply, holding back the flood waters that now go into the ocean.

* * *

Los Angeles is having a paving scandal and the city council is investigating patented pavements and their effect on politics and city government. It started from a bankruptcy case. The referee wanted to know how $14,000 charged to promotional work was really spent. It developed that a lot of it was spent in promoting the election of candidates to the city council who would favor the pavement which this company laid, and it also developed that at least $30,000 had been spent in this and similar ways. An attorney for the company is said to have received 10% of its profits because of his influence at the city hall. His name has not been divulged and the names of eight candidates who are said to have received financial aid in their campaigns are still unknown, at least to the public. The prominent politician who admits that he spent the money for them says that he has forgotten their names.

The *Los Angeles Times* says editorially of the investigation that it hopes it may be possible, "so to broaden the inquiry as to make it possible to cover all phases of the paving subject." And also, "It may even answer the question of whether patent paving is worth its extra cost or if the interest of paving companies in politics is purely altruistic."

Assistant City Attorney Neal, who is in charge of the office during the city attorney's absence, says that if the council desires to get rid of this and other paving scandals, all it has to do is to stop specifying patent pavements. There is nothing in the licensing agreement the city has with the owners of the patents to compel the council to use the patents. All the agreement amounts to is a permission for the city to use the patented pavements at a certain price.

The advice seems sound. It appears to the writer that it is very much up to the companies that control patents on methods of paving to show how and why their pavements are better than those which may be laid without infringing anybody's patent. The writer has been reading and abstracting literature and reports on paving of all sorts for some years. He has known and talked with many engineers throughout the whole country about paving. But never in any report or in any conversation with anyone who really knew anything about paving, has he read or heard it said that any of the patented pavements were better than those which might be made by a competent engineer using any of the standard unpatented methods.

The harm that is done comes from the way the patented pavement companies (and there is more than one of them in the business here) secure contracts. Most paving here is done by petition. The abutting property holders petition the council for the paving and the petition generally specifies the kind that is wanted. Of course, the companies promoting patented types will spend considerable money to have their types specified, and they are not too particular how they spend it. The council thinks the petitioners must have investigated the matter, although, of course, they never do, and puts the specification into effect.

The public pays the extra cost of promotion, but that is not the only harm that is done. It causes those interested in other forms of paving a great deal of trouble and expense to see that they get a square deal. So it is to be hoped that the whole paving subject will be thoroughly investigated and that the public will get the truth about promotion methods. It will benefit not only Los Angeles but the rest of the country.

* * *

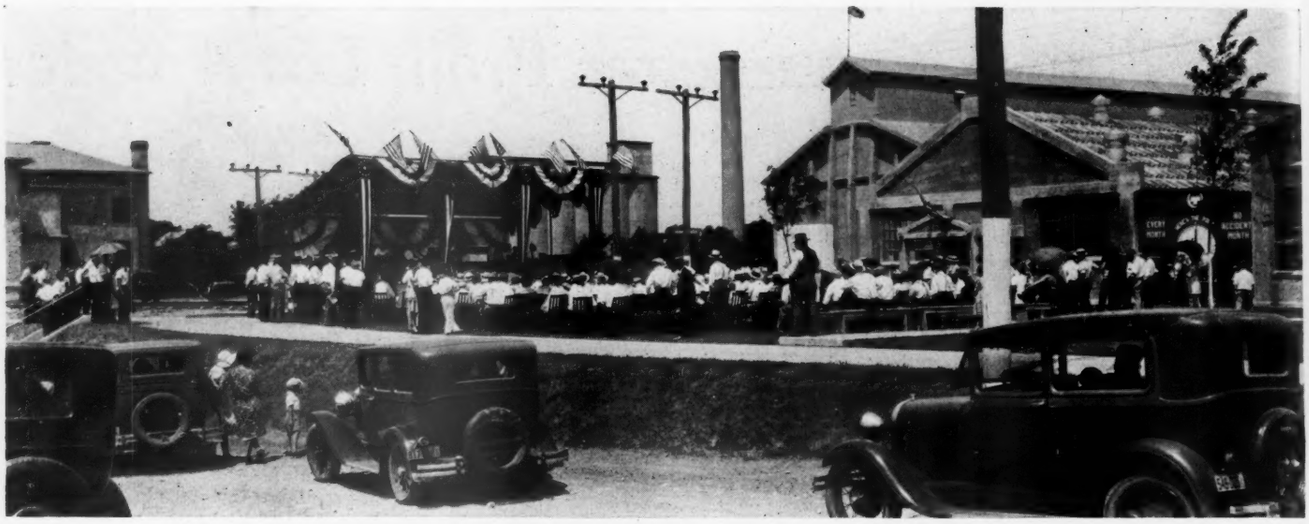
The ordinances permitting the building of the Bell cement plant have finally been repealed. Undoubtedly the election which was to have been held would have turned the ordinances down so it was a good thing to save the expense. The most interesting editorial comment I have seen was this, which appeared in a leading paper:

"Any shadow of excuse for granting the permits to 'fight the cement trust' has long since disappeared. The Bell plant could not have offered this so-called cement combination, if there was any such thing, effective competition without making an intolerable nuisance of itself by going into large-scale production."

Mayor Vetoes Concrete Sewer Ban

A RESOLUTION passed recently by the Dearborn, Mich., city council which would have prohibited the use of monolithic concrete in Dearborn sewer construction was vetoed at a later council meeting by Mayor Ford.

"Brick may be a better material than concrete for sewers, but I do not believe the taxpayers should be required to bear the added cost of brick," Mayor Ford said. —*Detroit* (Mich.) *News.*



Trophy dedication ceremonies in progress at La Salle, Ill.

A Dozen Plants Dedicate Safety Trophies

SAFETY trophy dedications, the outstanding celebrations of the year among the cement mills, continue with unabated interest. While business conditions this year are not such as to encourage unnecessary expenditures, the value of celebrating past records and working up enthusiasm for new ones has been so great that these occasions have been held without interruption. And the effect upon the public, as well as on employes of the industry, has fully justified the efforts.

The Portland Cement Association safety trophy contest has been referred to frequently by safety speakers and writers as one of the most successful, and the association receives many calls from other industries for advice on how contests of this kind may be successfully conducted. So much favorable comment has accumulated relative to the size and beauty of the trophy and the impressiveness of a monument erected where workers and public may see, that complete information regarding it is being offered without obligation to industrial concerns and railroads.

Wabash Holds Splendid Affair

On June 25 the Wabash Portland Cement Co. celebrated its perfect safety record in 1930, at its Stroh, Ind., plant. Employes and their families and neighbors were invited to assemble in the park on the plant property for picnic lunch, after which the formal ceremonies of dedicating the association trophy were conducted. H. F. Jennings, secretary and general manager of the company, officiated. After a short introductory speech by Mr. Jennings, Congressman Hogg paid high tribute to the safety work of the plant and lauded it as an example which would be of great benefit to other industrial concerns. The speaker, whose reputation as a proponent of safety legislation is well known, assured the workers of government interest in the subject and predicted continual improvement in the reduction of injury to industrial workers.

Lester E. Palmer, works manager, gave an interesting description of the work performed at the Stroh plant during the year. Superintendent Glenn Hall gratefully acknowledged the gift of the Portland Cement Association and pledged a continuation of the safe record.

The attendance was enhanced during the afternoon by many of the company's dealers and sales force, all of whom were greatly impressed by the progress made by the mill.

Federal Plant Celebrates

Winning of the association trophy was celebrated at the plant of the Federal Portland Cement Co., an affiliate of the Bessemer Cement Corp., at Buffalo, N. Y., on the afternoon of July 1. W. E. Bliss, vice-president of the Bessemer organization, was in charge of the affair and presided at the formal ceremonies.

Stanley Owens, safety engineer, represented the Portland Cement Association and made the speech of dedication. Elmon S. Hill, superintendent, responded on behalf of the company and employes, and E. L. Benton, representing the New York State Workmen's Compensation Fund, made the address of the day.

The attendance included two hundred employes of the plant, their families, friends and a number of visitors.

July 4 at Petoskey

Petoskey, Mich., was the scene of an unusual party on July 4, when cement employes of the town and their friends combined the celebration of Independence Day with the dedication and unveiling of their safety trophy.

At 10:30 a. m. the operating and sales force of the Petoskey Portland Cement Co. assembled at the mill office and marched to the site of the monument. At the head of the procession was the Petoskey city band, followed by President J. B. John, Treasurer and General Manager John Galster, Vice-President Homer Sly, and General Superintendent E. C. Switzer. An audience of four or five hundred were waiting, and on arrival of the marchers Mr. Sly called the assemblage to order.

The trophy was presented by A. J. R. Curtis and accepted by Mr. Switzer. Mayor Norman M. Risk of Petoskey who was then introduced, paid high compliment to the cement mill, informing his audience that it was not only the largest, but most assuredly the safest industry in northern Michigan.

President J. B. John addressed the men on the subject of plant efficiency as well as safety and appealed to the men to help reduce cost wherever possible as a help to the company in the present economic crisis. Mr. John told the men that only as a last resort would their wages be cut. Mr. Galster traced the progress of the company from its inception and predicted an even brighter future, with the necessity for improved facilities.

Congressman Frank P. Bohn of the eleventh Michigan district, which includes Petoskey, was the speaker of the day. Following the ceremonies the crowd moved by car to the county fairgrounds where a barbecue had been prepared for 2,500. In addition to the employes and their families and friends, there was a large representation of

Barbecue at Trinity dedication, Ft. Worth, Texas

the population of Petoskey and many visitors from other northern Michigan cities. After lunch the crowd assembled at the race track for an afternoon devoted to interesting sports and contests.

Lone Star Dedication at Houston, Tex.

On June 23 the mill organization of the Lone Star Cement Co. Texas, at Houston, held the ceremonies connected with the unveiling of its association trophy. The plant, which has long been a show place in that vicinity, had attracted many visitors for the occasion, among these being Mayor Walter Monteith and a group of city officials.

The formal ceremonies took place on the lawn in front of the plant, where the association safety monument had been erected. C. F. Simpson of Dallas, district engineer of the Portland Cement Association, presented the trophy and in so doing reminded the workmen that in this industry the first common obligation—that of guarding the welfare of its men—was being taken care of most admirably at the Houston plant.

Mayor Monteith observed that the no-accident record of the plant resulted from excellent cooperation between employe and employer. The mayor pointed out that the cooperative safety movement had done more than anything else to cement friendly relations and to promote morale. H. O. Sutherland, shipping foreman, accepted the trophy, reminding fellow employes that it was given as a means of future inspiration and that, from the experience of other winners, it is harder to remain at the top of the safety list than it is to climb there.

W. R. D. Moncure, safety director of the Houston Chamber of Commerce, praised the work of Superintendent C. J. Lofstedt.

Impressive Program at Nazareth, Penn.

With impressive ceremonies, Nazareth mill No. 4, of the Pennsylvania-Dixie Cement Corp., formerly the plant of the Dexter Portland Cement Co., dedicated its safety trophy won from the Portland Cement Association for a perfect safety record in 1930.

R. B. Fortuin, assistant to the general manager, who is also chairman of the cement section of the National Safety Council, presided during the exercises.

Joseph Brobston, vice-president of the Nazareth Cement Co., was introduced by the chairman as official representative of the Portland Cement Association. Mr. Brobston extended the congratulations of the association and neighboring plants on the achievement and formally presented the trophy.

Earl Rinker, a member of the safety committee of Plant 4 for the year 1930 accepted the trophy, as chairman of that committee, on behalf of his fellow employes in a few fitting remarks.

A selection by the Nazareth Band was followed by an address by Blaine S. Smith, president of the corporation. Mr. Smith extended congratulations to all the employes and executives of the plant for the hearty cooperation in the past year, and stated that no award of such a nature would have been possible without the active interest of each employe.

A selection by the band and an address by Harry D. Kutz, lawyer of Bethlehem, followed. Mr. Kutz spoke along the same lines and was followed by Morris Fortuin, general manager of the Pennsylvania-Dixie plants in this section, in a short address.

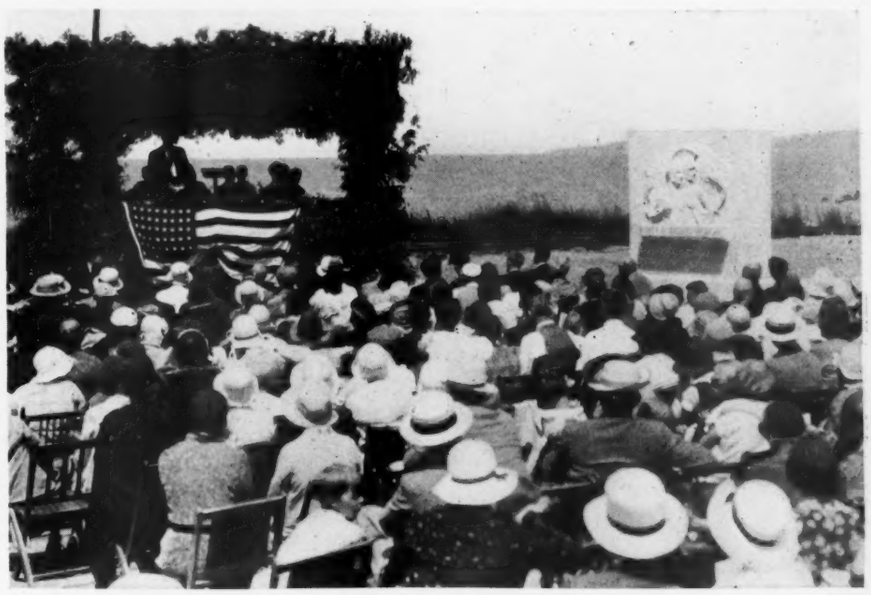
San Antonio, Tex., July 9

San Antonio mill of the San Antonio Portland Cement Co. held a unique ceremony on Thursday, July 9, celebrating the third dedication of its safety trophy for a no-accident year.

San Antonio was the first mill to win the Portland Cement Association trophy, which it did in 1923, with a record of only three lost time accidents, an astonishing feat at that time, being far better than that of any other contender. In 1927 it won a re-award of the trophy for a perfect record.

At the ceremonies on July 9, a large assemblage was present, including leaders in the affairs of the cities and practically all of the higher officials, as well as the operating employes of the company. The principal addresses were made in English by Martin J. Arnold, a prominent attorney of San Antonio, and in Spanish by James Tafolla, Sr., also an attorney. Among company officials who appeared to congratulate the employes were C. Baumberger, Sr., president; C. Baumberger, Jr., vice-president; Charles Baldus, treasurer and H. O. Rinehold, plant manager.

After the ceremonies there was a con-



E. C. Switzer accepting the trophy at Petoskey, Mich.

cert by the company's fine concert band and a barbeque.

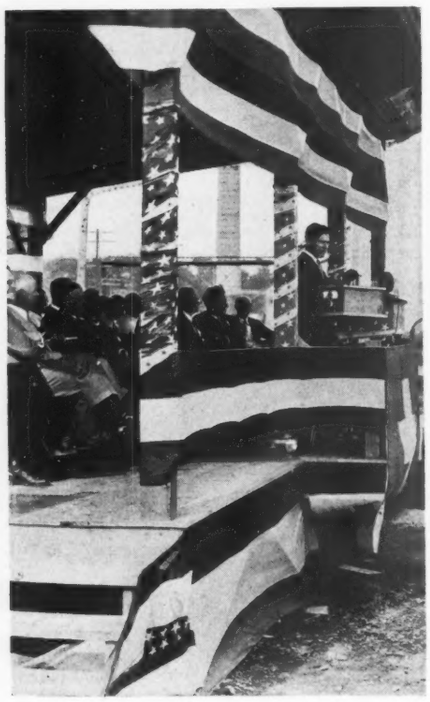
At Fort Worth, Texas

On Wednesday, July 8, occurred the celebration in honor of the winning of the Portland Cement Association safety trophy at the Fort Worth (Texas) plant of the Trinity Portland Cement Co. The weather was ideal, 400 employes and their families and over 100 guests were present, and the spirit of the occasion was entered into most heartily by the entire assemblage.

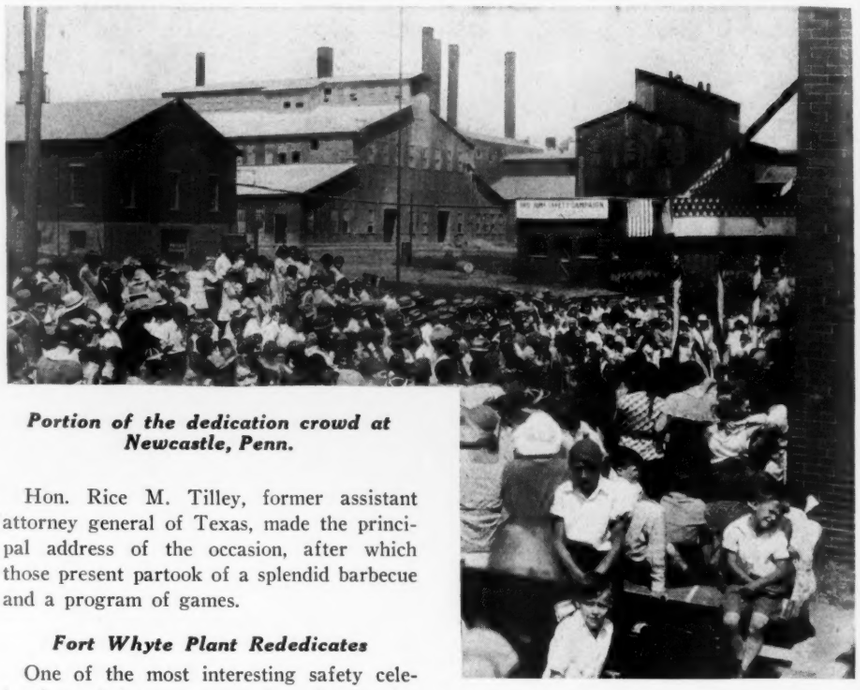
The trophy has been set up in a little park area before the plant which looked as if it had been prepared for the purpose; arrangements were complete in every detail, reflecting considerable credit on the plant safety committee.

Charles F. Simpson, district engineer for the Portland Cement Association at Dallas, presented the trophy on behalf of the association, after which it was accepted by Superintendent A. A. Chaney, speaking on behalf of the men of his organization. Charles E. Ulrickson, vice-president and general manager of the Trinity company, welcomed the employes and their families as well as the special guests and spoke of the principles necessary for avoiding mishaps, which, he pointed out, the men of that mill are fully aware of and know how to apply.

Mr. Ulrickson said that safety had been stressed as one of the fundamental precepts of the Trinity organization and that his company never would hire a careless man. Both of the other mills under his management had already won the trophy and he was greatly pleased to welcome the Fort Worth mill into the ranks of the winners.



Governor Lafollette of Wisconsin, speaking at Manitowoc



Portion of the dedication crowd at Newcastle, Penn.

Hon. Rice M. Tilley, former assistant attorney general of Texas, made the principal address of the occasion, after which those present partook of a splendid barbecue and a program of games.

Fort Whyte Plant Rededicates

One of the most interesting safety celebrations of the year occurred on the occasion of the rededication of the safety trophy of the Fort Whyte plant of the Canada Cement Co., on July 13. The plant is located eight miles southwest of the city of Winnipeg.

A fleet of large buses mobilized in Winnipeg, carrying a group of prominent guests and employes and their families. Many leaders in Winnipeg's industrial and civic life were in the party. On arrival at the plant an inspection trip was provided through the newly rebuilt mill, housing a number of the largest kilns and grinding mills in Canada. A souvenir descriptive booklet was presented to each of the visitors.

Following the inspection trip the rededication ceremonies were held on the parked oval at the entrance to the plant. Superintendent V. C. Hamilton called the assemblage to order and called upon A. J. R. Curtis of the Portland Cement Association to present the award. In relating the facts of the perfect record, Mr. Curtis told how the men of the electrical department had topped their fellow workers with 2,863 days without accidents. Next came the employes of the machine shop with 2,695 days. In other departments, millworkers had 1,563 days, the shipping department 1,517 days, the kiln workers 1,066 days, the carpenters 573 days and the quarry workers 571 days since the last accident took place. Mr. Curtis congratulated the workers on their fine record and the spirit of cooperation with which they had worked with the cement company in reducing the hazards of their occupation from one of the most dangerous listed by the National Safety Council of the United States, to the most safe.

On conclusion of Mr. Curtis's remarks, Mr. Hamilton called upon J. D. Johnson, president of the Canada Cement Co., to accept the reinscribed trophy. Mr. Johnson traced the progress of the Canada mills to their present enviable position with respect to accident prevention and highly complimented the Portland Cement Association on its leadership in the safety movement.

Another speaker was John McEachern, president of the Winnipeg Board of Trade, who represented the industries of greater Winnipeg. Mr. McEachern made a brief congratulatory address which indicated the tremendous good will value of a successful safety campaign.

Major Charles K. Newcombe, commissioner for the Workmen's Compensation Board, congratulated both the firm and the employes and told of the enormous bill, nearly a million and a half a year, which Manitoba taxpayers pay annually to support broken and maimed men and destitute widows and children left by workmen accidentally killed. He pleaded for a more widespread following of the example of the safety campaign of the cement workers.

Harry Brown, chief chemist of the Exshaw, Alberta, plant, who came as a delegate from the Exshaw organization, expressed the hearty congratulations of the sister plant, 800 miles west, on the perfect accident record of the Winnipeg mill.

G. W. Allan, prominent Winnipeg attorney and director of the Canada Cement Co., was the last speaker. Mr. Allan, an orator whose rare humor and pleasing psychology left everyone in splendid humor, told of the development of Winnipeg and the western provinces and predicted a bright destiny for the city and its industries.

At the close of the program a picnic supper was served in tents erected in the area before the plant, after which there was a dancing party and general jollification. Among the guests not mentioned above were

W. G. H. Cam, power and safety engineer of the Canada company, and G. Andrew Grant, district sales manager.

Exshaw Celebrates July 15

On July 15 a similar celebration was held in the village of Exshaw, Alberta, in honor of the perfect safety record during 1930 of the Canada Cement Co. mill located there. J. D. Johnson, president, and W. G. H. Cam, power and safety engineer of Montreal; G. A. Grant, district sales manager at Winnipeg; Arthur McGuire, district sales manager at Calgary, and A. J. R. Curtis of the Portland Cement Association, comprised the official party which journeyed to Exshaw for the occasion.

Located as it is in the Canadian Rockies, near Banff, Alberta, the Exshaw plant and surrounding village enjoys a picturesque setting. The association trophy, which was won for a perfect record in 1928, was not placed on the plant property, but occupies a commanding position in a central parkway at the head of a boulevard which forms the main street of the town. A group of approximately 250 people, representing the entire personnel of the plant and population of the town, with a small company of special guests from throughout the province, assembled at the monument at 4:30 p. m.

In his opening remarks Superintendent W. D. Armstrong recalled the unusual record of the plant, there having been but one lost time accident in nearly four years. He felt with the start which had been made and the experience that had been gained, the mill should now be able to continue without accident for several years to come.

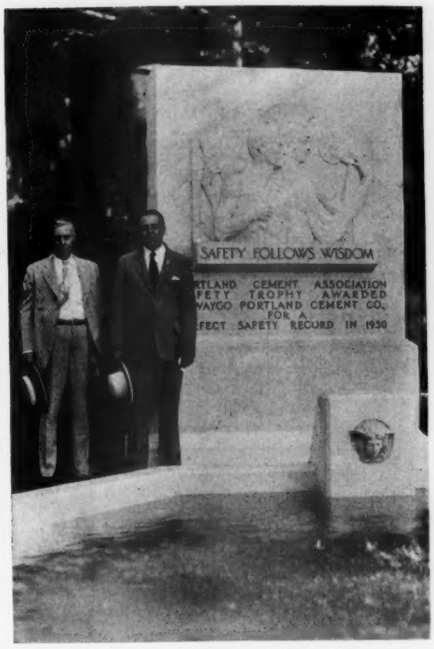
A. J. R. Curtis represented the Portland Cement Association in presenting the trophy bearing an added inscription. He thanked the mill and quarry employes for their wonderful example, which, he said, had greatly benefited other plants in the industry. J. D. Johnson, president of the Canada company, accepted the award for his men and in so doing asked each man to pledge himself to make the award an annual affair.

The assemblage adjourned to the hotel where, after a friendly round of handshaking, the employes and their guests moved into the dining room, to partake of a banquet served by the ladies of Exshaw.

La Salle, Illinois, July 15

The Alpha Portland Cement Co.'s plant at LaSalle, Ill., also unveiled its safety trophy on July 15. Present as guests of the local organization were G. S. Brown, president; F. G. McKelvy, vice-president; J. F. McGee, management engineer; W. W. Hamilton, safety engineer, of Easton, Penn., and A. N. Fellows, sales manager, of Chicago. General Superintendent Henry McClarnan and Superintendent Gus Lundberg also formed part of the official party.

The safety trophy was presented by Stanley Owens, safety engineer, Portland Cement Association, Chicago, and was accepted by Walter O. Menning. Several very interesting addresses followed, including ones by G. S. Brown, president, Alpha Portland Cement Co., Easton, Penn.; H. M. Orr, mayor of the city of LaSalle; H. J. Force, director accident prevention and safety, Chicago Motor Club, and Dr. T. J. McCormack, principal LaSalle-Peru township high school.



Governor Wilbur M. Brucker of Michigan, with J. B. John, at Newaygo

In the course of his remarks, after complimenting the LaSalle mill on its splendid record, President Brown said:

"It is my habit to review at the end of each year many items of expense in connection with the operation of our company. At the end of 1929 I was disturbed to note the high cost of accidents in connection with the automobiles operated by our salesmen. In the meantime accident frequency in our quarries and mills was steadily increasing. My attention had previously been called to this through the fact that the man who handled our insurance said he had been unable to keep our liability rates on automobiles down to the figure of the previous year because of our bad record.

"In November, when our insurance expired, I found that the carrier had determined to withdraw from further risk, but that the results of the few months prior to November had been so much better that they were willing to continue at the old rate.

"We placed the safe operation of our automobiles under our safety director and as a matter of interest I think you will be glad to know that whereas our accidents to our automobiles during the 6 months of 1930 aggregated 27, the number of accidents for the first 6 months of 1931 was but 7."

Manitowoc, Wis., July 16

Outstanding among the trophy dedication ceremonies of the year was the occasion at the plant of the Manitowoc Portland Cement Co., Manitowoc, Wis., on July 16. Not only was it attended by leading industrialists from the entire adjoining section of the state but Governor LaFollette was present to assist in making the affair an object lesson to workers in all Wisconsin industries.

W. L. White, Jr., general superintendent, presided. C. D. Franks, manager of midwestern offices of the Portland Cement Association, made the presentation of the monument on behalf of the association. F. E. Town, superintendent of the Manitowoc plant and past chairman of the cement section of the National Safety Council, accepted the trophy on behalf of the plant organization. Following these addresses J. B. John, president of the Manitowoc company and its parent organization, the Medusa Portland Cement Co., spoke to the plant men, praising the splendid cooperation which they accorded him in the management of the company as evidenced by the perfect record. Mr. John voiced again his belief that it is unnecessary for industry to create widows, orphans or workers who must go through life discouraged or poverty stricken through physical handicap.

Mr. John spoke very earnestly to the men regarding business conditions in the industry and the necessity of cutting waste in every way possible. Referring directly to the situation within the Medusa company he told the men that dividends on the common stock had been discontinued but that the company would not cut the wages of its men except as a final resort, as he believed that the welfare of the country and an early return to prosperity depend upon the maintenance of good wages to the working people. In return, Mr. John pleaded for the loyal support of all employes; and from the thunderous round of applause at the conclusion of his remarks it was plain that he would receive it.

Following Mr. John, the chairman introduced H. Vanderwerp, formerly vice-president of the Manitowoc company and lately vice-president of the Manitowoc and Medusa companies, in charge of the Chicago office. Mr. Vanderwerp said, in part:

"This is my first opportunity since leaving Manitowoc to address the employes in a body, and I want to express to you my appreciation for your wonderful cooperation, and to say that the years I spent here at Manitowoc have been very happy indeed. I am happy with you today in celebrating the victory which this trophy symbolizes. This just goes to show the concrete demonstration of the power of an idea. The management had provided all the mechanical safeguards required by law, others dictated by our own judgment, but still accidents continued. We were complacently going

along saying that we had done everything possible, but accidents would happen. With this mental attitude, it was inevitable that accidents should happen. Until Mr. John and other leaders of the industry pointed out to us that something more was necessary, and until you men in your own minds determined you were going to do something about this, and were going to stop these accidents, we didn't make progress. But now we've done it—here's the trophy—we've got the hang of the thing, and we can do it again, and I hope that annually we'll gather here to chisel the numerals for another year on that trophy as our answer to that age-old question, 'Am I my brother's keeper?'"

At the conclusion of Mr. Vanderwerp's remarks the chairman introduced State Senator John Cashman, who introduced Governor LaFollette as the speaker of the day. After acknowledging a loud round of applause, Governor LaFollette said, in part:

"Two generations ago, mankind discovered how to begin to harness the forces of nature. Up to that time man was doing the work of the world, and had been doing it by almost the same identical laborious and back-breaking methods for hundreds and hundreds of years; but about two generations ago mankind began to discover how to harness the forces of nature and make them do some of the work. As new inventions appeared on the horizon, we had first the steam engine and the steam boat. People heard a rumor that somebody had an idea of making an engine and a boiler, and putting water into the boiler and then a fire under the water, resulting in some kind of a contraption that would actually travel on rails; and when the idea came along most of our ancestors doubted and jeered at it. But today we stand in the midst of the greatest industrial and mechanical civilization in the history of the world. And each new invention, each piece of machinery, each product of machine production, is an example of what the brain and the brawn of man, when harnessed together, can accomplish.

"As we began to build an industrial civilization there came in its wake the tragedy of industrial accidents, maimed bodies, maimed lives, children left orphans, children left to hunger, to want. It was almost as if the gigantic industrial machine was leaving in its wake, like a great sort of dragon, ruin and broken lives. Then the intelligence of man began to query: 'Can't we manufacture in this industrial age without this terrific loss of life?' Now we have begun to demonstrate that accidents are not a necessary part of industrial production, and you gentlemen in this plant, you men who are out there in the plant itself, upon whom the primary responsibility rests as to whether you shall or shall not have accidents, are here today as a demonstration of what men can do, when they work together in cooperation. This afternoon you have dedicated this beautiful monument, placed in this beautiful setting, as a symbol of accomplishment—not of something you hope to do, but a thing you have done, and every time you see the trophy as you walk into this plant, it should answer this question which frequently recurs in our minds as to whether we have the intelligence to master our problems. I am sure that we have the intelligence, but what we need is the courage and the stamina to team up with that intelligence.

"Your president, Mr. John, has referred this afternoon to the industrial depression. Gentlemen, it seems to me, as I see this trophy and what it means, that if there is any answer to this question of unemployment, that trophy answers it, because tundamentally unemployment, technological or brought on by depression of this kind, is again in exactly the same sort of a category, the same kind of thing, as industrial accidents. It's not natural; this depression is produced by this gigantic machine that we have—a production machine, getting out of kilter, somehow or other. Some of us, some place, have been negligent in the operation of this industrial machine. We have learned how to eliminate industrial accidents. It seems to me that we must in turn learn how to eliminate unemployment as an undesirable by-product of mass production. If we can master industrial accidents, we ought to be able to master the greater evil of unemployment by the same methods—by the application of intelligence and courage and cooperation."

Governor Brucker at Newaygo

One of the most colorful affairs in the recent history of the village of Newaygo, Mich., took place on July 17, when the association safety trophy awarded to the Newaygo Portland Cement Co. was dedicated in the presence of about 2000 persons from Newaygo, adjacent cities and many other parts of the country.

Following a parade of the employes from the mill to the public park where the exercises were held, the assemblage was seated and the invocation pronounced by Rev. Frederick Pinch, after which W. L. White, Jr., general superintendent, made the address of welcome. Mr. White called upon G. E. Warren, assistant general manager of the Portland Cement Association, who presented the trophy.

The trophy was unveiled by Miss Donna Furlong, daughter of Assistant Superintendent Walter Furlong, and formally accepted by the superintendent, Lyle E. Smith, who told of the difficulties surmounted in attaining a perfect record. President J. B. John was then called upon amid prolonged rounds of applause. Newaygo was his home for a long period of years while Mr. John acted as superintendent and later manager and vice-president of the Newaygo company. Mr. John knows almost every inhabitant, having served the town in numerous public capacities. He was mayor for several terms and was forced to resign from this position when he became president of one of the

largest cement companies in the country which required that he move to Cleveland. But Mr. John has continued to keep a home in Newaygo and the townspeople are not unaware of his continued attachment for their city. Mr. John made it plain that he took more than ordinary pleasure in the honors earned by the plant which he managed for so many years.

The vice-president and treasurer, E. J. McGuire. also spoke enthusiastically of the fine safety work done at the Newaygo mill and mentioned particularly the help derived from the women and of the potent influence of good home environment in working safely. At the conclusion of his remarks, Mr. White introduced Governor Wilbur M. Brucker of Michigan, whose interest in the cause of industrial safety has become well known. The governor had flown to Newaygo in an autogyro plane from Petoskey.

Governor Brucker, in a message of unusual interest and feeling, lauded the safety work of the cement plants and quarries and urged that the movement be strengthened and carried forward until it would prevail throughout all industrial and business lines. The governor appeared greatly interested in the handsome cast stone monument which he inspected with President John. The trophy setting at Newaygo is one of the finest arranged at any of the winning plants, including a concrete pool, fountain, flood light and benches.

Ohio Organization Is Developing Local Silica Deposit

PAUL BALLARD was made sales manager of the Ohio Quartz Products Corp., August 1, it was stated recently by D. Spurgeon Parry, organizer of the corporation. Mr. Ballard, who has had wide experience as a salesman will begin immediately to introduce the products of the company.

Work is progressing on the plant which is located just outside of Jackson. They have recently opened a gravel pit a short distance from the D. T. & I. railway, where sand is being produced.

The company has already developed a trade in the sale of sand.

It is expected when the plant is completed that both sand and fire brick, made from Jackson county silica gravel, will be sold.—*Jackson* (Ohio) *Sun-Journal.*

Rubert M. Gay

FUNERAL services for Rubert Manly Gay, president of the Gay Manufacturing Co., New York, N. Y., who died Aug. 5 following an operation in Morristown, N. J., were held Aug. 6.

Mr. Gay, who was one of the pioneers in the development of air separators and similar equipment, was sixty-three years old and for the past fifteen years has made his home at Boonton, N. J.—*New York* (N. Y.) *Herald Tribune.*

Value of First-Aid Training Emphasized in New Movie Film

THE VALUE of a practical knowledge of first-aid methods is strikingly emphasized in a new one-reel educational motion picture film entitled, "Learn and Live," prepared by the United States Bureau of Mines, Department of Commerce, in cooperation with an industrial concern.

During 1930, more than 100,000 people in the United States died as the result of accidents. and nearly 3,000,000 others were injured, a title points out. Many of these lives could have been saved and much suffering prevented by proper first-aid treatment.

In the movie, members of the family of a mine official attend a first-aid class of miners, conducted by the Bureau of Mines instructors, where interesting and valuable first-aid methods are illustrated.

Copies of this safety film, "Learn and Live," may be obtained for exhibition purposes by clubs, schools, churches, business and safety organizations, miners' local unions, and others interested by applying to the Pittsburgh Experiment Station of the United States Bureau of Mines, Pittsburgh, Penn. No charge is made for the use of the film, although the borrower is asked to pay transportation charges.

Leadership Essential for Results in Accident Prevention Work

THE SUGGESTION that the right kind of business leadership can curtail if not eliminate lost-time accidents in the sand and gravel industry, or in any other industry for that matter, is no longer subject to challenge, says V. P. Ahearn in a recent news letter of the National Safety Council.

The excuse that the workmen themselves take foolish chances of their own accord is a futile evasion of the duties imposed upon the executive. The responsibility rests upon him, whether he admits it or not. The cooperation of the employes can be obtained if the simple measures used by other companies are followed, and they can be depended on to administer discipline to any within their ranks who deliberately ignore the safety code.

It has been estimated by the Department of Commerce that accidents cost American industry five billions of dollars annually. To purge the country of this poison in its economic system is a task to which all of us might devote even greater effort.

Industrial Accident Statistics

THE 1931 edition of *Industrial Accident Statistics* has been issued by the National Safety Council, Inc., Chicago, Ill. In this edition general figures on various industries are shown. Of interest to ROCK PRODUCTS readers are the statistics on accidents in the cement, mining and quarry industries.

Plans Silica Sand Development

SEVEN YEARS of negotiation and investigation upon the part of W. I. Sallee of Milwaukee, Wis., has finally resulted in a decision to organize a $1,500,000 corporation to undertake the mining and selling of silica sand from the deposit that extends along the east shore of Munising bay. Mr. Sallee has just made a trip to Munising and on July 27 he outlined the plans he and his associates have in mind.

Mr. Sallee stated that analyses that had been made at various laboratories have shown the deposit to be the best and largest that exists in the United States, while water transportation will enable the producer to put his sand into the several points of distribution along the Great Lakes at a price much lower than can be done from the silica sand deposits that are now being worked.

The principal users of this product are located on the shores of the Great Lakes, or at points not far distant, although it is believed that the cost of production can be kept down to such a point that the various products can be shipped to far distant points.

The plans, as they now exist, call for the erection of a plant for mining the sand by hydraulic process and a dock for shipping, the total cost to be about $450,000.

The plans also call for the erection of foundry and storage plants and docks at Milwaukee and Buffalo. The company will control the patent rights in drying and milling processes, which are said to be much in advance of those now in use.

It is possible that work may be started within the next 60 days.—*Escanaba* (Mich.) *Press.*

Reports Rockslide Benefits Asbestos Corp., Ltd.

ASBESTOS CORP., LTD., Thetford Mines, Que., Canada, reports the sliding of a large tonnage of mill rock from the southwest face of the Beaver pit at Thetford Mines. Officials of the company state that mining operations at the face where the slide occurred had been discontinued two years ago, as operations by that time had undermined the wall and made it unsafe.

It would have been necessary to trim the face before operations could have been resumed, and plans for taking down the upper sections of the wall had already been considered. The earth overburden had already been removed preparatory to commencing this work. This natural fall has made available a large amount of broken rock, amounting to approximately 150,000 tons, and has made unnecessary costly drilling and blasting, which would otherwise have been necessary. Working conditions are said to have been considerably improved by this slide.—*Toronto* (Canada) *Financial Post.*

Foreign Abstracts and Patent Review

Proposed German Specifications for Alumina Cement. According to Hugo Vierheller, alumina cement is becoming of increasing importance; however, Germany does not yet have specifications for alumina cement except those proposed some months ago. These proposed specifications are based in general upon the American portland cement specifications with the necessary exceptions and extensions. Alumina cement is burned or fused from mineral materials, primarily lime, alumina and ferric oxide. It must not show an excess of 2% insoluble and 8% silicic acid, and must contain no carbides, sulfides and phosphides decomposible by water. Not more than 1% foreign materials may be added to normal alumina cement after the burn. Additions of accelerators or materials for other purposes must not exceed 10%. A 1:3 normal alumina cement shall have a minimum strength in kg. per sq. cm. of 400 compressive and 25 tensile after 1 day in damp air, 500 compressive and 30 tensile after 28 days in water, and 600 compressive and 40 tensile after 28 days in combined storage. The 28-day water storage test applies to alumina cement for marine construction.—*Tonindustrie-Zeitung* (1931) **55**, 22, pp. 325-6.

Effect of Magnesia on Alumina and Portland Cements. By adding small quantities of caustic magnesia to alumina cements, H. Luftschitz was able to decrease the self-heating from 141 and 134 deg. C. to 111.5 and 114 deg. C., as is evident from the following table:

INCREASE IN HEAT OF ALUMINA CEMENTS (WITHOUT ADDITION OF SAND)

Addition of magnesia	Initial temperature	Final temperature
	1. Lafarge Fused Cement	
0%	18.5 deg. C.	134.0 deg. C.
1%	20.0 deg. C.	140.5 deg. C.
3%	19.5 deg. C.	114.0 deg. C.
10%	20.0 deg. C.	128.0 deg. C.
	2. Alca Fused cement	
0%	18.5 deg. C.	141.0 deg. C.
1%	20.0 deg. C.	121.0 deg. C.
3%	19.5 deg. C.	111.5 deg. C.
10%	20.0 deg. C.	126.0 deg. C.

Some caustic magnesia was added to two alumina cements with the following results in strength:

Addn. of magnesia	Tensilth strength 1 da.	3 da.	7 da.	Compressive strength 1 da.	3 da.	7 da.
	1. Lafarge Alumina cement*					
0%	30.2	33.3	36.0	483	614	606
1%	33.5	34.9	35.7	485	638	595
3%	32.4	35.5	36.8	487	668	674
	2. Alca Alumina Cement					
0%	32.8	33.4	38.6	336	448	514
1%	35.9	36.2	45.7	432	480	586

*Average of five tests.

Three portland cements which contained different percentages of aluminia, gave the results tabulated below when caustic magnesia was added.

The strengths have increased here also. It can be assumed that the finished alumina cement contains also some percentages of free Al_2O_3.

But also in the case of ordinary portland cement, especially with low Fe_2O_3 content, it can be assumed, in presence of a high alumina content, that an addition of caustic magnesia can work out very favorably. The alumina and portland cements to which 1 to 3% caustic magnesia was added, did not suffer in soundness.—*Tonindustrie-Zeitung* (1930) **54**, 54, pp. 887-891.

Differentiation of Qualities of Cement. Stig Giertz-Hedstroem and Donavan Werner point out that in relation to its manifold applications the cement industry has been standardized to an exceedingly high degree. But a highly developed industry is designated not only by standardization but also by a suitable specialization which, however, has not been effected systematically in the cement industry.

This includes portland cement and its substitutes; iron portland cement, blast furnace cement, French grappier cement, soliditit cement, puzzolana, aluminate cement, ore cement, all of which are required to be applicable for identical purposes and in identical manner, portland cement being given as the type.

Investigations are being made to determine the possibilities of a rational specialization of cement for the purpose of providing special qualities in a cement intended for a special purpose. The investigations to be made include the disadvantages of cement, such as low tensile strength, solubility in water under pressure, in seeping water, unsoundness, heat generation in hardening, slow hardening and decrease in strength when adding considerable water, of which qualities one or the other may be improved to suit a special purpose. The two special cements desired are a cement for marine construction and one for surface construction, the latter showing decreased shrinkage, quicker hardening and greater strength as compared to marine construction cement, and also increased solubility and greater generation of heat in hardening, while the marine construction cement should show less solubility and less heat in hardening, including possibly greater shrinkage, slower hardening and lower strengths. Results are to be reported.—*Zement* (1931), 20, 10, pp. 213-215.

Cement	Analysis of cement, % SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	Al_2O_3: Fe_2O_3	Average tensile strength, kg. per sq. cm. 1 da.	3 da.	7 da.	14 da.	Addition of magnesia
Ordinary portland....	19.54	0.61	10.04	62.07	0.67	16:1	16.4	17.0	26.8	32.2	0%
							18.7	20.2	34.8	40.4	3%
High grade portland	19.44	2.62	4.48	65.60	1.64	2:1	29.3	30.9	29.9	42.0	0%
							28.0	30.8	31.4	42.4	3%
Ordinary portland....	20.72	1.50	6.60	63.19	1.70	4:1	17.5	23.5	28.4	34.4	0%
							20.6	24.8	33.2	38.5	3%

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

High-Temperature Cement. A cement has been patented which, the inventor says, will not crack, chip or peel under conditions of coke oven operation. It consists substantially of: Silica sand, 15 parts; ground silica brick, 3 parts; portland cement, 2 parts, and soda ash, 1½ parts; all by weight. The sand used contained 95% SiO_2 and the ground silica brick 98.2% SiO_2. The materials are mixed in a dry state and applied dry with a flow gun, the nozzle being in direct contact with a nozzle that emits atomized water. The cement may also be used wet and applied with a trowel. It forms the binder before heat is applied, but after it is sufficiently heated the soda ash binds the materials into a hard mass.—*Addie Hutchinson, U. S. Patent No.* 1,787,625.

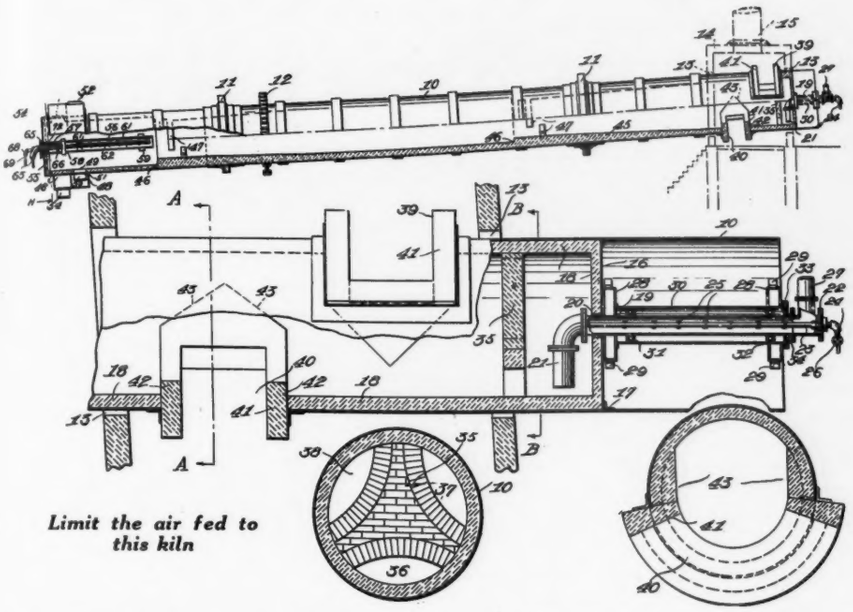
Treating Cement with Chlorine. The inventor claims that by numerous experiments he has found that the chlorine and not the calcium is the active agent in calcium chloride when it is used with portland cement to accelerate hardening and increase density and high early strength. Hence he treats portland cement with free chlorine gas, preferably during the finish grind operation. The cement then takes up and retains the optimum percentage of chlorine for the best results in hardening and high early strength. It is claimed that cement prepared in this way is quite non-hydroscopic and even moisture resistant and that it will keep in ordinary storage indefinitely.—*Hans. M. Olson, U. S. Patent No.* 1,792,755.

Acoustical Material. The acoustical material covered in this patent includes a fibrous base, such as granular mineral wool, a binder of starch gel, corn flour or similar material, an agent to give plasticity to the composition and an albuminous substance to give water resistance.

The method of manufacturing is also included in this patent and covers preparation of the ingredients, wet mixing, molding, drying and finishing. The absorption claimed for a tile of this material ¾-in. thick is:

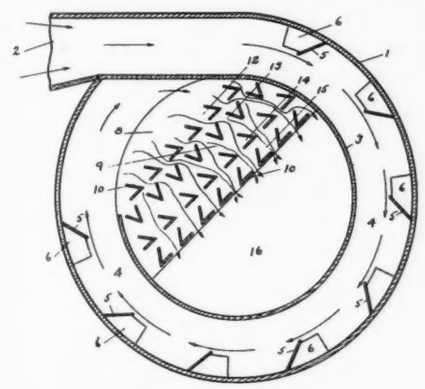
	C_4	C_5	C_6
Pitch			
Absorption %	0.53	0.70	0.53

George D. King and Roger H. Stitt, assignors to United States Gypsum Co., Chicago, Ill. No. 1,769,519.



Limit the air fed to this kiln

Dust and Soot Separator. The form of this invention shown is adapted to use in a stack, but the inventor says that it may be used in other situations. The current of air or gas containing dust is brought into a circular passage through a tangential box shaped pipe. In the passage are baffles which provide spaces of relative quiet in which the dust can settle. Leaving this passage the dust laden air goes to a circular chamber in which are many angular baffles.



Baffles catch the dust

The dust that settles falls in the quiet spaces within the angles to a chamber below, while the dust free air rises to the stack. Other forms of baffles than those in the cut are shown.—*Harry B. Meller and Stehman A. Bokius, U. S. Patent No.* 1,790,481.

Cement Kiln. The main feature of the kiln described (which is the invention of well-known cement mill engineers) is that it is closed to the admission of air except as air is supplied through pipes with regulating valves. The closed feed end extends through a chamber at the base of the stack. Through this end two concentric pipes pass to admit raw material and air. The outer pipe carries the raw material, the inner has nozzles set so that the air that passes through them blows the feed toward the kiln. The feed pipe dips down at the end so that the raw material is deposited on the lining of a chamber of the kiln.

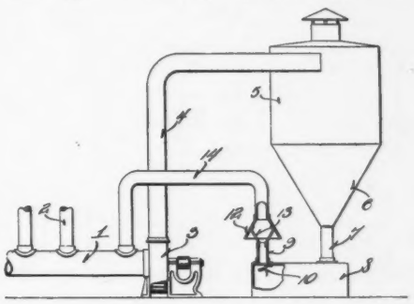
From this chamber the raw material flows forward through three small openings, shown on one of the sections. The air entering with the feed serves to burn any unburned fuel in the gases of combustion, drying and preheating the raw material.

The two notches in the kiln shown at the feed end are the openings for the combustion gases to pass into the stack. The raw material flows past these without going into the stack because of the high walls with which the openings are surrounded. After this the passage is through a straight cylinder until the burning zone is reached. This is partially closed off by double baffles, and it is similarly closed off at the discharge end. The feed falls over a shoulder as it enters the burning zone because this zone is of a little larger diameter than the remainder of the kiln. There is a similar shoulder at the burning zone discharge end.

The clinker passes from the burning zone to the cooling zone and this surrounds the pipes for air and fuel so that they are preheated by radiation from the hot clinker. The fuel, which may be powdered coal or oil or other similar fuel, is put into the kiln in a manner not unlike that of admitting the raw material. There are two concentric pipes, the outer for fuel and the inner for air, and the air pipe has nozzles set to blow the fuel along. In an alternative form there is provision for admitting more air than can be put through the pipe by means of openings in the closed end.

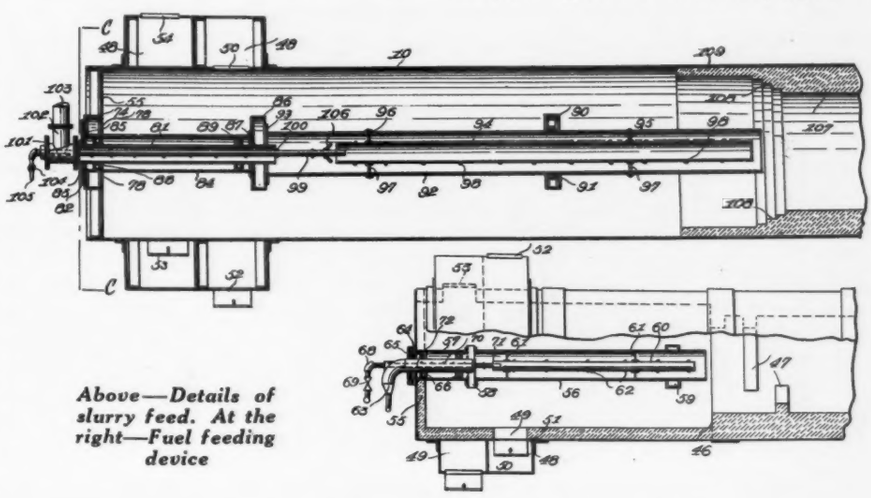
The clinker falls from the end of the cooling zone into two closed annular chambers that surround the kiln at the end. A door into each chamber from the kiln opens and shuts by gravity as the kiln revolves and a similar door, but set on the opposite side, opens and shuts to allow the clinker to fall out of the chamber. In this way the kiln is closed off from direct communication with the air.—*Robert W. P. Horn and Jacob H. Nissley, U. S. Patent No.* 1,779,626.

Venting Dust Collector. A method of handling dusts, especially inflammable dusts such as powdered coal, employs a short vent



Short vent to reduce explosion hazard

pipe terminating in a funnel instead of the usual tall vent pipe. This funnel is under an inverted funnel which is connected by a pipe to the suction manifold of the dust collecting system. The inventor claims that this device does not clog as the usual tall vent pipe sometimes does and hence the liability to explosion is greatly reduced.—*G. Kohlmier, U. S. Patent No.* 1,769,182.



Above—Details of slurry feed. At the right—Fuel feeding device

Dust Recovery from Rotary Dryers in Coal Preparation Buildings

By E. H. de Coningh
Dust Recovering and Conveying Co., Cleveland, Ohio

THE INDEPENDENT BUILDING for the crushing, drying and pulverizing of coal has been a feature of many plants, especially in the cement industry, that for some time has been inspected less closely for cleanliness than the other plant structures. Coal dust has been considered to be a necessary nuisance, and since one or two operators can run a good sized plant, the unhealthful working conditions in a dusty coal building have not been so conspicuous as in the departments where a larger number of workers find employment. The installation of dust control equipment in many plants has shown a great improvement in conditions, with a saving in fuel that frequently has placed the new machines on more than a self-sustaining basis. Two examples of such installations are described below.

Comparison of Results

Fig. 1 is a photograph of the coal preparation house of the Columbia cement plant of the Pittsburgh Plate Glass Co. at Zanesville, Ohio, before the dust was controlled. Fig. 2 shows the same building after installation of the dust control equipment. The stack from the direct fired rotary dryers was the worst source of dust, but the crusher, pulverizers and mechanical conveying equipment all contributed to the unpleasant total. The successful use of bag filters in the packing and finish grinding departments suggested their use here and resulted in an installation as detailed in Fig. 3. The green coal enters the right-hand end of the building and is delivered to the crusher by a belt conveyor. The crushed coal is elevated to the storage bin, and then fed to the Fuller rotary dryer, which is 4 ft. 6 in. in diameter by 42 ft. long, and has a rated capacity of 10 tons per hr. In this dryer the combustion chamber encloses most of the dryer shell, and the flame is directed below and at 90 deg. to the axis of the dryer. After heating the outside of the shell, the combustion gases, at about 400 deg. F., are directed through a breeching to the inside of the dryer, and are exhausted back in counterflow to the coal. The crushed and dried coal is then elevated to the bins over the Fuller pulverizers, all three of which discharge to one screw conveyor feeding the Fuller-Kinyon conveying system. One branch of this system leads back to the storage bin which feeds the dryer burner, while the main line conveys the coal to the kilns.

The Dracco dust collecting system is laid out to collect the dust from all points in the building where it is created, so that all the handling equipment will be under a slight negative pressure. The dryer exhaust was the worst nuisance, and this volume is the largest proportion of the air handled through the filter equipment. The dryer exhaust fan was left in place, but the stack was changed to deliver the air and products of combustion to the filter inlet manifold. Branch intake lines were connected to the crusher, elevator, and the vent on the dryer bin to clean up the right-hand end of the building.

Collecting Pulverizer Dust

To collect the dust which formerly leaked out from the pulverizers it was found most satisfactory to connect one line to the common screw conveyor, which was provided with a trough of large cross section, and to collect the dust from all the mills through the existing discharge chutes. The branch to the bin vents handles the air displaced when the pulverizer bins are being filled, so this end of the building is made as dust-free as the other. Fig. 2 shows the improvement effected by the operation of the dust control equipment, and the air inside the building is just as clean as outside.

The table on the following page gives the results of tests run on the equipment.

The most significant figure is the 4.35% recovery of dust, which is discharged from the filter equipment in a regular flow, and carried back to the pneumatic conveyor by a screw conveyor. The dryer exhaust fan handles approximately the same volume with the filters in operation

Fig. 1. Dust discharge from coal preparation plant

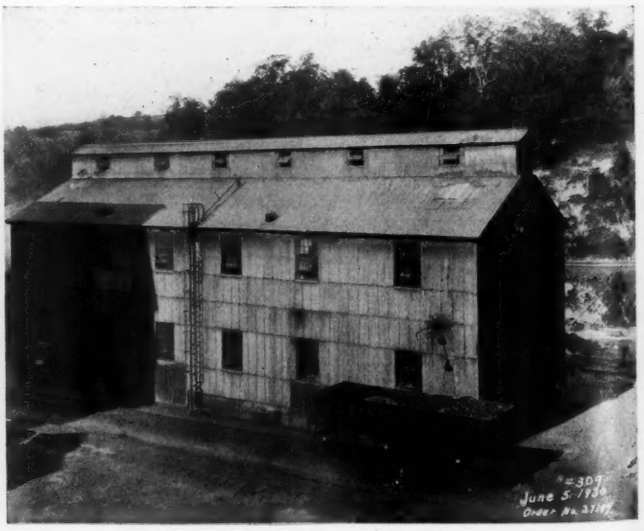


Fig. 2. Same plant with recovery equipment in operation

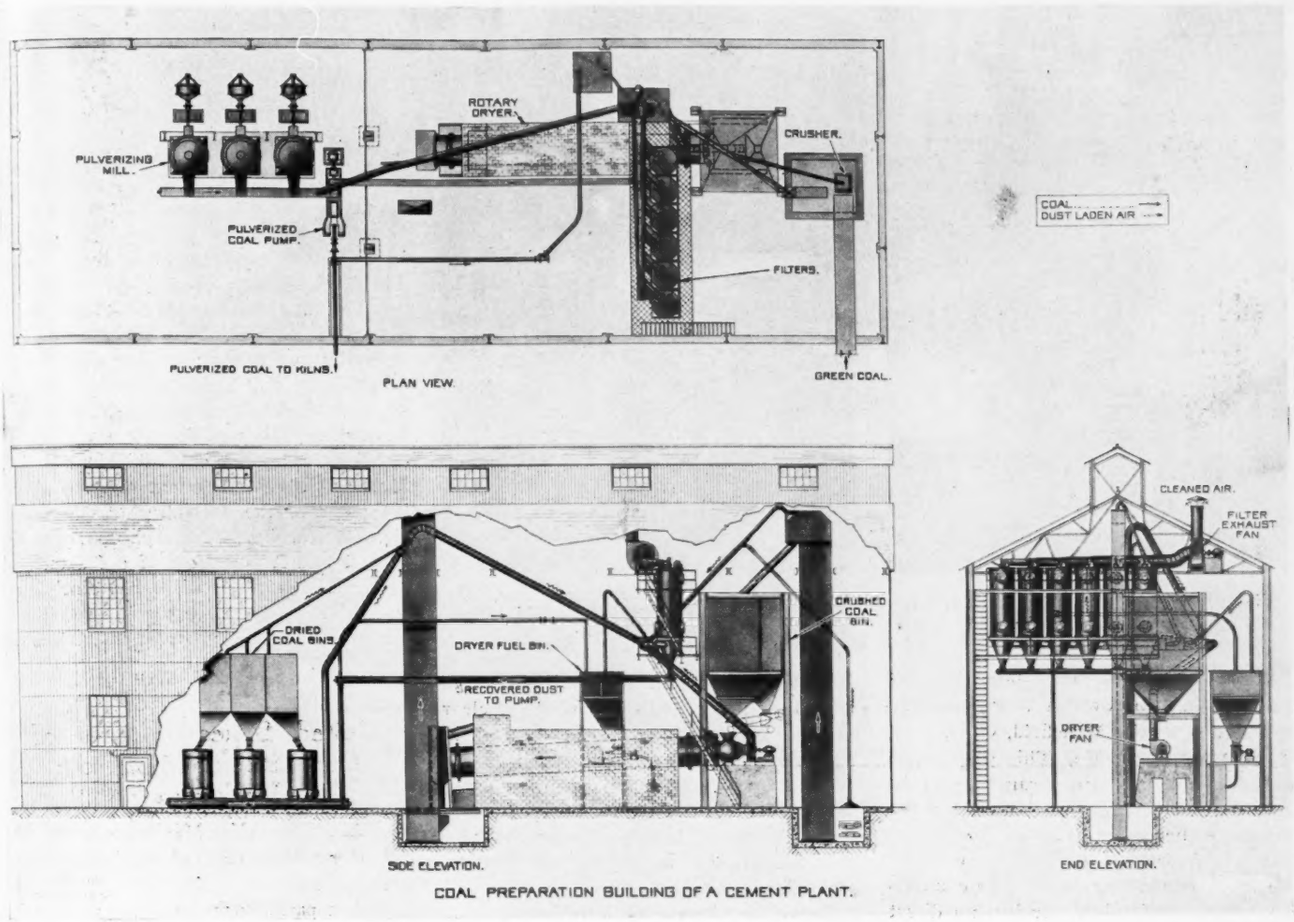


Fig. 3. Coal plant equipped with dust recovery installation

as before, so the dust from this source has not been increased. Of course, the ash from the combustion of the coal used in drying is also recovered with the dust and cannot be considered as a saving in fuel. But assuming that 8% of the weight of coal thus burned is recovered as ash, 4.24% of the total coal is still saved. It is possible that the dust recovering system picks up a little more dust than leaked out formerly, but 0.24% of the total is a liberal allowance for this factor, and it is conservative to say that 4% of the fuel prepared is recovered for use, where it was formerly discharged to the atmosphere, inside and outside of the preparation building.

Approximately 10,000 c.f.m. of air at 142 deg. F. are drawn through the filters, which is an overload for this six compartment unit. The high static drop of 4.6 in. of water causes some dust to be forced through the filter fabric at the intervals, about ten minutes apart, when the dust is automatically shaken down from the bags in each compartment in rotation. This air volume can be reduced to improve the collecting efficiency of the filters to over 99%, and this change is scheduled to be made. The addition of air at atmospheric temperature and relatively low moisture conditions from the mills and conveying equipment to the dryer stack gas brings the average moisture burden of the filtered air low enough that no condensation has occurred at existing temperatures. The total power requirements of the system are about 20-hp., most of which is consumed by the motor which drives the filter exhaust fan.

Fig. 4 is a side view of a second Dracco

TEST RUN ON EQUIPMENT AT PLANT SHOWN IN FIGS. 1 AND 2

Coal through dryer	17,530 lb. per hr.
Dust recovered	763 lb. per hr.
Coal consumed by dryer	247 lb. per hr.
Per cent of total coal as dust	4.35
Per cent of total coal consumed by dryer	1.41
Moisture in green coal	3.92%
Moisture in dried coal	1.84%
Moisture removed	2.08%
Filter inlet temperature	160 deg. F.
Filter inlet static pressure	—1.9 in. water
Filter outlet temperature	142 deg. F.
Filter outlet static pressure	—6.5 in. water
Pressure drop through filters	4.6 in. water
Air volume through filters	10,050 c.f.m. at 142 deg. F.
Air volume from dryer	5,200 c.f.m. at 142 deg. F.

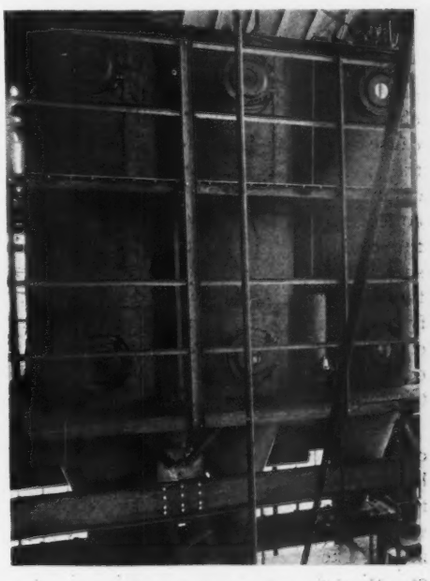


Fig. 4. Side view of a dust recovery installation

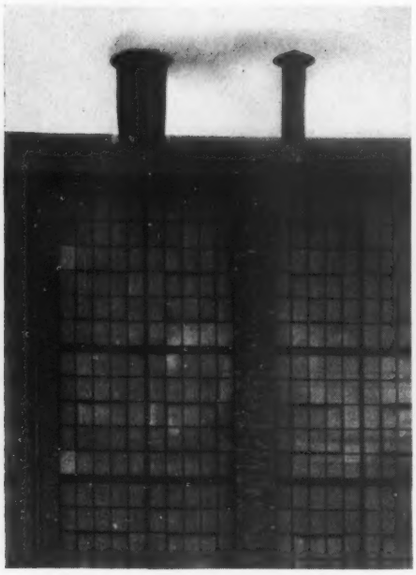


Fig. 5. Former dust discharge from coal mill stacks

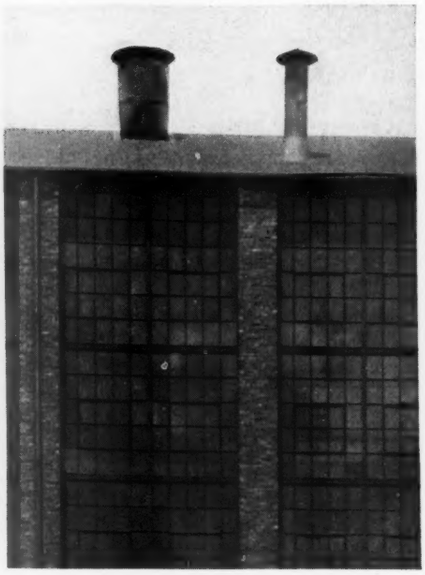


Fig. 6. Present discharge, free from visible solids

filter installation of the same size, but arranged in two rows of three compartments each, at the Mansfield, Ohio, plant of the Ohio Brass Co. This preparation plant is more compactly arranged, and the purchase of slack coal eliminates the crusher. The green coal is elevated to bins which feed a direct fired 6-ft. by 30-ft. Buckeye rotary dryer. The combustion chamber of this dryer has no direct contact with the shell, and consists of an independent baffled brick furnace. The products of combustion then enter the shell of the dryer proper, pass through once in counterflow to the coal, and are finally exhausted through a fan. The dried coal is elevated to bins over two Raymond pulverizing mills, and the pulverized fuel is finally delivered to points of consumption by an air transport system.

Stack Dust a Nuisance

The conditions inside the building were satisfactory, but the three stacks discharged sufficient dust from the roof to cause a serious nuisance to the rest of the plant and the neighborhood. The dryer exhaust fan discharged to a cyclone collector, but the exceeding fineness of the coal dust (86.1% through 300 mesh screen) caused most of it to escape from the vent stack. The two excess air vents from the air separation system also discharged dust whenever the mills were in operation, and contributed their quota to the larger nuisance.

The filter installation replaced the cyclone collector, and in addition, a branch line was connected to the two vents of the bin so that all the dust laden air would be exhausted through the equipment. The accompanying table gives the operating data, and Figs. 5 and 6 show a comparison of the former dust discharge from the cyclone vent with air discharge from the filter exhaust fan, which is clear of any visible solids. With the filters in operation, there is no temptation to cut down the air volume through the dryer in order to reduce the dust nuisance, and a more economical balance between volume and temperature of drying air can be secured.

The test results are tabulated below.

Approximately two-thirds of the air through the filters, or 5100 c.f.m., consists of dryer exhaust air, which may contain a relatively high moisture content during the months when the green coal runs high in moisture. For this reason, the housing and the main intake pipeline were insulated with 1-in. Flaxlinum. This was comparatively inexpensive, and while it does not present a very finished appearance without an outside sheathing, still it insures against condensation on the inside surfaces. It is apparent from the moisture readings that by raising the temperature of the dryer gas within conservative limits, as much as 10% moisture can be removed without interfering in any way with filter performance.

The total dust recovered is 1.25% of the weight of coal prepared, and while some dust was previously collected in the cyclone, by far the larger proportion may be credited to the filter equipment, which in this case consumes less than 9-hp. The 7650 c.f.m. is a conservative volume for this size equipment to handle with best performance, which means complete collecting efficiency as far as can be checked by visible dust discharge, and a pressure drop of less than 3 in. of water through the filter equipment.

Acknowledgment is extended to R. W. McAllister, superintendent of the Columbia plant of the Pittsburgh Plate Glass Co. for furnishing the photographs in Figs. 1 and 2, and most of the data, and to F. L. Wolf, technical superintendent and chief engineer of the Ohio Brass Co. for providing the photographs taken at that plant.

FINENESS OF RECOVERED COAL DUST

	Per cent. through 65 Mesh	100 Mesh	200 Mesh	300 Mesh
Columbia Cement Co.	94.2	92.8	89.6	85.7
Ohio Brass Co.	93.0	90.6	88.4	86.1

TEST RESULTS AT PLANT SHOWN IN FIGS. 5 AND 6

Filter inlet temperature, dry bulb	122 deg. F.
Filter inlet temperature, wet bulb	102 deg. F.
Dew point	98.5 deg. F.
Relative humidity	50%
Filter exhaust temperature, dry bulb	116 deg. F.
Temperature drop through filters	6 deg. F.
Filter inlet static pressure	—1-in. water
Filter exhaust static pressure	—3.7-in. water
Pressure drop through filters	2.7-in. water
Coal through dryer	20,000 lb. per hr.
Dust recovered	250 lb. per hr.
Dust recovered, per cent. of total coal	1.25
Power consumed by fan motor	8.4-hp.
Air volume through filters	7,650 c.f.m. at 116 deg. F.
Air volume from dryer	5,100 c.f.m. at 116 deg. F.
Moisture removed	2.75%

United States Imports of Graphite and Mica from Madagascar

GRAPHITE AND MICA are among the more important of the nonmetallic minerals for which the United States is dependent partially upon sources without its political confines. With the practical withdrawal of Canada as a supplier of prepared phlogopite mica, the market for that variety is dominated by Madagascar, says an article in a recent issue of *Commerce Reports.*

Well over 90% of the export of graphite from Madagascar to the United States, according to the permits, was for crystalline flake, valued at $2,792.

In the case of mica shipments, a somewhat unusual condition appears. While total quantities of mica fell off in 1930 from 1929 shipments, the changes in franc-values reveal an actual increase.

A tonnage increase of 62% is shown in 1930 exports of mica direct to the United States. However, during the first quarter of the present year, no direct shipments to the United States were reported.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Production Data on Ready-Mix Concrete

A Summary of Central-Plant-Mixing and Truck-Mixing Operations in 20 Commercial Concrete and Individual Contract Plants in 12 States

By Fred C. Wilcox
Pelham Manor, N. Y.

THE chart to which the following discussion applies is a tabulation of the figures on ready-mixed concrete plant operation, production costs, trucking costs, material costs, selling prices, etc., contained in 20 answers to a questionnaire sent to operators of commercial and individual plants located in 16 different localities of 12 different states. For obvious reasons the names and locations of the plants are not given.

The list of plants includes a representative number of both "wet" and "dry" plants, that is, central-plant-mixing and truck-mixing operations.

Daily capacity as listed probably in most instances represents the maximum capacity rather than the average output of the plant. Variation in output will, of course, affect both production costs and trucking costs.

The scale of plant labor and truck drivers' wages was fairly uniform during the period covered (1930). With one exception, namely, plant 18, which apparently reported its entire operating personnel, the number of men employed in central plant production ranged from 2 to 7, averaging between 3 and 4 men.

Figures reported on plant production and trucking costs are naturally quite erratic. The averages are of interest and possibly some value. A considerable variation in the estimated costs of producing and hauling ready-mixed concrete is to be expected, because the industry is new, there is a notable difference in plant setups and operating methods, a wide spread in the amount invested in plant equipment and plant sites, and it would be unusual to find uniform cost accounting methods.

It is interesting to note that in one plant production cost per cubic yard is stated to vary from 14c to 50c. This could easily result from varying daily output. In 14 plants giving estimated production costs, the figures vary from 14c to 90c a cu. yd. The average is 55c.

In estimated trucking costs the figures show a correspondingly broad variation, namely, from 15c to 89c per cu. yd. per mi. Obviously in some instances the figures represent estimated actual cost of trucking, in other cases they no doubt include a profit in the hauling operation. Length of haul and number of cubic yards hauled per trip are the chief factors affecting the yard-mile cost. The average figure for 17 plants reporting their hauling costs is 42c per cu. yd. mi. It is of interest to compare this figure with the trucking costs in two plants where the hauling is contracted and should therefore include a normal profit for the hauling contractor. The contract figure, on the basis of a 4-mi. haul, is 29c a cu. yd. mi. in one plant and 30c a cu. yd. mi. in the other plant, or respectively $1.16 and $1.20 for delivering a cubic yard of concrete a distance of four miles from the plant, which figure should include a normal profit on the hauling operation.

Base prices of materials in different parts of the country (1930) show, as expected, a wide variation. The high, low and average costs in 16 plants, eight of which produce mainly crushed stone concrete and eight gravel concrete, are shown as a matter of comparison only.

TABLE I—BASE PRICE OF MATERIALS IN 16 READY-MIXED CONCRETE PLANTS

Crushed Stone, all sizes, per cu. yd.			
High	$2.40	Low	$0.98
Average (8 plants)			$1.73
Gravel, all sizes, per cu. yd.			
High	$1.89	Low	$0.78
Average (8 plants)			$1.47
Sand, per cu. yd.			
High	$3.08	Low	$0.52
Average			$1.40
Cement, per bbl.			
High	$2.75	Low	$1.72
Average			$2.11

TABLE II. COST OF MATERIALS FOR 1 CU. YD. OF 1:2:4 CRUSHED STONE CONCRETE

(Computed from the base prices in Table I, using arbitrary quantity factors indicated below)

Crushed Stone (90c per cu. yd.)			
High	$2.16	Low	$0.88
Average			$1.55
Sand (45c per cu. yd.)			
High	$1.39	Low	$0.24
Average			$0.69
Cement (1.48 per bbl.)			
High	$4.07	Low	$2.55
Average			$3.10
Total Cost of Materials			
High	$6.14	Low	$3.94
Average			$5.35

TABLE III. COST OF MATERIALS FOR 1 CU. YD. OF 1:2:4 GRAVEL CONCRETE

Gravel (81c per cu. yd.)			
High	$1.53	Low	$0.63
Average			$1.19
Sand (41c per cu. yd.)			
High	$0.86	Low	$0.25
Average			$0.52
Cement ($1.34 per bbl.)			
High	$3.56	Low	$2.47
Average			$2.84
Total Cost of Materials			
High	$5.46	Low	$3.35
Average			$4.56

Columns 16, 17, 18 and 19 of the chart show the individual costs and total costs of materials for 1 cu. yd. of 1:2:4 crushed stone or gravel concrete. These figures were not included in the answers to the questionnaire, but are computed from the base prices in Columns 13, 14 and 15, assuming arbitrary quantity factors, and while these costs are approximate they are sufficiently accurate for the purpose of this analysis. The high, low and average figures for 8 plants producing crushed stone concrete and 8 plants producing gravel concrete are shown.

Study of the material prices, material costs for a cubic yard of concrete and the selling prices in this chart are chiefly of value in developing the relation of material costs to net selling prices. High, low and average figures on material cost, net selling price, and the spread between

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A Tabulated Summary of Operating Costs, Production Costs, Material Costs, Selling

	Type and capacity plant			Labor scale		Production cost		Trucking cost	
	(2)	(3)	(5)	(6)	(8)	(9)	(10)	(11)	(12)
	Type plant (wet or dry)	Size mixer and hauling units	Daily capacity of plant (cu. yd.)	Rate per hour	Number men used in plant	Estimated production cost cu. yd.	Basis of estimating this cost	Estimated hauling cost per cu. yd. per mi.	Basis of estimating this cost
1	Wet	2-yd. mixer 2½-3-yd. body	300	50c DL	2	50c	Includes labor and overhead	37½c (2-mi. haul)	Contracted at 75c first 2 mi., 10c each additional ½-mi.
2	Wet	2-yd. mixer	400	45c DL 50c TD	3	50c		15c	
3	Wet	1-yd. mixer		40c DL 50c TD	3	14c to 50c		30c to 50c	
4	Wet	2-yd. mixer	300	40c DL 60c TD	3	40c		65c average	Average $1.00 per zone (6 2-mi. zones)
5	Wet or dry	1-yd. body (dump, transit)	400	35c DL 40c TD	3	75c		75c	Zone haul in city—25c extra per yd. mile beyond
6	Dry		300	45c DL 50c TD	4			25c	
7	Wet		300	40c DL 50c TD	2			18c to 20c	
8	Dry		200	50c DL $35.00 wk. TD	3	50c		(20c)	$1.00 cu. yd. to 5-mi. limit
9	Dry	1-yd. body	100	50c DL 60c TD	3	(75c)	$5.50 cu. yd. for 1:2:4	(50c)	$1.00 cu. yd., 1-yd. loads, 2-mi. haul
10	Wet	2-yd. mixer 3-yd. body	500	55c DL $33.00 wk. TD	7	75c	Not incl. plant depreciation	36.6c	$1.10 cu. yd., average 3-mi. haul
11	Wet	3-yd. mixer 3-yd. body	500	50c DL $33.00 wk. TD					
12	Wet	3-yd. body	450	65c DL $45.00 wk. TD	5	58c		60c	
13	Dry		250	50c DL 50c TD	6	39½c	Average for 2 months	89c	Average for 2 months
14	Dry		350	40c DL 50c TD	6				
15	Wet	3-yd. mixer 3-yd. body	600	55c TD	2	16c		30c	
16	Wet		160	30c DL 45c TD	2				
17	Wet		600	60c DL 60c TD		73c	Includes plant depreciation	17c	
18	Dry	3-yd. body	200	30c DL 33c TD	16	50c		75c	
19	Wet		Over 1000	45c DL 65c TD		(90c)	$5.00 cu. yd. for 1½-in. gravel concrete	(33c) 4-mi. haul	90c first mi., 15c each additional mi.
20	Wet		500	60c DL	3			(30c) 4-mi. haul	Contract, 75c first mi., 15c each additional mi.

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Notes—Costs of aggregates bought on a ton basis have been converted to a cubic yard basis as follows (prices were those in effect in 1930):
For stone or gravel: Price per ton × 1.3 equals price per cubic yard.
For sand: Price per ton × 1.5 equals price per cubic yard.
DL = Plant labor.
TD = Truck drivers.

rices, Etc., in 20 Commercial and Individual Plants in 12 Different States

Material cost per cubic yard			Cost of materials for 1 cu. yd. of 1:2:4 concrete				Selling price of 1:2:4 concrete per cubic yard				
(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	
one (S) or ravel (G)	Sand	Cement (bbl.)	Stone (or gravel) ("S" indicates "G" gravel concrete, cols. 15 to 23, incl.)	Sand crushed stone	Cement concrete and	Total	Base price 1:2:4 concrete per cu. yd.	Basis of prices, deliveries, etc.	Discount	Net price	
$2.31 S or G all sizes	$2.31	$2.04 bulk 2.54 bag	$2.08	$1.04	$3.02 bulk	$6.14	$7.50 plus 1.00 cartage — 8.50 delivered	Delivered in 2-mi. zone. A charge of 10c is made for each additional ½-mi. haul	10c cu. yd.	$8.40 in 2-mi. zone	1
2.40 S 1.82 G	2.10	2.05 bulk	2.16 S 1.47 G	.95 S .86 G	3.03 S 2.75 G	6.14 S 5.08 G	8.20 S 7.75 G	Zone prices	25c cu. yd.	7.95 S 7.50 G	2
2.85 S (2 in.)	2.25	2.10 bag	2.57	1.01	3.11	6.69	(Individual contract operation—No concrete sold)				3
.98 G (¾-in. to 1½-in.)	1.13	1.72 bulk	.88 S .79 G	.51 S .46 G	2.55 S 2.30 G	3.94 S 3.55 G	7.35 (in 2-mi. zone)	Prices in other zones: 3-4 mi., $7.45; 5-6 mi., $7.65; 7-8 mi., $7.85; 9-10 mi., $8.05	25c cu. yd.	7.10 (in 2-mi. zone)	4
1.55 G	1.55	2.66 bulk 2.76 bag	1.26 G	.64 G	3.56 G bulk	5.46 G	8.20 G	General price in city, 25c extra per cu. yd. per mi. outside	50c cu. yd.	7.70 G	5
1.50 S ½-in.-2-in.) .75 S ¾-in.) 1.10 G	.75	1.79 bag	1.35	.34	2.65	4.34	7.50	General price	5%	7.12½	6
.78 G	.60	1.84 bulk	.63 G	.25 G	2.47 G	3.35 G	6.50 G	General price	2% to 5%	6.17½ G	7
1.82 S ¾-in. to 2-in.)	1.00	2.14 bulk	1.64	.45	3.17	5.26	8.00	General price in 5-mi. zone	50c cu. yd.	7.50	8
1.50 G ¾-in.-1¼-in.)	1.00	2.33 bag	1.22 G	.41 G	3.12 G	4.75 G	8.00 G	Price is for 50 or more cu. yd. in 2-mi. zone (1-5 cu. yd., $9.50)	50c cu. yd.	7.50 G	9
1.89 G	1.28	1.85 bag	1.53 G	.52 G	2.48 G	4.53 G	7.75 G	Price is for 30 cu. yd. or more (zone price, average haul, 3 mi.)	50c cu. yd.	7.25 G	10
1.75—2-in. 2.00—1½-in. 2.25—¾-in. S	1.00	2.20 bulk	1.58 (2-in. S)	.45	3.26	5.29	8.50		50c cu. yd.	8.00	11
1.65—¾-in. S 1.60 G	1.00	1.88 bulk	1.49	.45	2.78	4.72	(Individual contract operation—No concrete sold)				12
1.65 S	1.13	1.90 bulk	1.49	.51	2.81	4.81	8.25	General price for 3 cu. yd. or more	50c cu. yd.	7.75	13
1.63 S	3.08	1.97 bulk	1.47	1.39	2.92	5.78	8.70	Price for 50 to 250 cu. yd. (over 500 cu. yd., $7.90)	Net	8.70	14
1.15 G	1.17	2.10 bulk	.93 G	.48 G	2.81 G	4.22 G	7.50 G		25c cu. yd.	7.25 G	15
1.30 S	.52½	2.75 bag	1.17	.24	4.07	5.48	9.29		10%	8.32½	16
1.62½ S or G	.52½	2.37½	1.46	.24	3.52	5.22	6.45 plus hauling charge	Zone price, 100 cu. yd. or more (under 100 cu. yd. is 50c extra per cu. yd.)	5%	6.12 plus hauling charge	17
1.60 G	1.50	2.30 bag	1.30 G	.61 G	3.08 G	4.99 G	7.50 G (average)	Special price for each job	2%	7.35 G (average)	18
1.50 G (1½-in.)	.98	1.85 bulk	1.22 G (1½-in.)	.40 G	2.48 G	4.10 G	7.60 G (1½-in.) (first zone)	Zoned prices	5%	7.22 G (1½-in.) (first zone)	19
1.95 G	2.25	2.14 bulk	1.58 G	.92 G	2.87 G	5.37 G	7.50 G (at plant)	Hauling charge added to base price at plant	2%	7.35 G plus hauling charge	20

Notes—The cost of materials for 1 cu. yd. of 1:2:4 concrete (cols. 16 to 19, inclusive) are, approximate, based on the following factors:

	Cement	Sand	Stone or gravel
For 1 cu. yd. stone concrete	1.48 bbl.	0.45 cu. yd.	0.90 cu. yd. (stone)
For 1 cu. yd. gravel concrete	1.34 bbl.	0.41 cu. yd.	0.81 cu. yd. (gravel)

material cost and net selling price, for 1:2:4 crushed stone concrete in 8 plants and gravel concrete in 8 plants are shown in the accompanying tables.

TABLE IV. RANGE IN NET SELLING PRICES OF 1:2:4 CRUSHED STONE AND GRAVEL CONCRETE, ALSO VARIATION IN MARGIN BETWEEN MATERIAL COST AND NET SELLING PRICE

1:2:4 Crushed Stone Concrete, 8 Plants
Cost of materials for 1 cu. yd. of 1:2:4 crushed stone concrete

High	$6.14	Low	$3.94
Average			$5.35

Net selling price of 1 cu. yd. 1:2:4 crushed stone concrete

High	$8.70	Low	$7.10
Average			$7.96

Gross margin between material cost and net selling price

High	$3.16	Low	$1.81
Average			$2.60

1:2:4 Gravel Concrete, 8 Plants
Cost of materials for 1 cu. yd. of 1:2:4 gravel concrete

High	$5.46	Low	$3.35
Average			$4.56

Net selling price of 1 cu. yd. 1:2:4 gravel concrete

High	$7.70	Low	$6.17
Average			$7.24

Gross margin between material cost and net selling price

High	$3.12	Low	$2.24
Average			$2.68

An Analysis of Costs and Gross Margins

Reviewing the figures on production and trucking costs, and comparing material costs per cubic yard of concrete with net selling prices, we get this picture: In 16 plants (8 producing crushed stone concrete and 8 gravel concrete), the average spread between material cost and net selling price was $2.60 a cu. yd. for 1:2:4 crushed stone concrete and $2.68 for 1:2:4 gravel concrete, or a combined average for the two classes of concrete of $2.64 gross margin per cu. yd. Out of this comes production and trucking costs.

Production cost per cu. yd. in 16 plants averaged 55c according to the reports, and this may be accepted as a fair average.

Trucking cost per cu. yd. reported by 16 plants averaged 42c a cu. yd. This figure is difficult to reconcile as being a fair average cost for hauling ready-mixed concrete because, in the first place, it obviously included in most instances a considerable profit on the hauling operation, and, in the next place, no figure can be set up as the cost of hauling one cu. yd. of concrete on a mile basis unless the exact average hauling distance is known. For the purpose of this analysis, therefore, it is probably best to use the figure reported by two plants which contracted their hauling. The contract price in these plants was on a basis which averaged 29½c per cu. yd.-mi. for a 4-mile haul, or $1.18 per cu. yd. for delivering concrete an average distance of 4 mi. from the central plant. As this distance probably approximates the average haul in ready-mixed concrete plant operation the figure of 29½c per cu. yd.-mi. may be accepted as a more nearly true picture on hauling costs and is still sufficient to include a normal profit on the hauling operation.

Summarizing the data on this basis, we find that in 8 plants producing crushed stone concrete and 8 plants producing gravel concrete of a 1:2:4 mix, the average net selling price was $7.60 a cu. yd. The average cost of materials for this concrete was $4.95 per cu. yd. Deducting production and trucking costs on the above basis left an average gross profit of 91c per cu. yd. as follows:

		Per cu. yd. 1:2:4 concrete
Average spread between material cost and net selling price		$2.64
Less:		
Average production cost	$0.55	
Average trucking cost, for a 4-mi. haul	1.18	1.73
Average gross profit per cu. yd.		$0.91

Local conditions may change the picture materially. It is difficult to say whether the costs on trucking and plant production developed by this analysis are sufficient in all instances to fully cover such items as depreciation, upkeep and interest charges.

Sanitary Engineer Believes Concrete Better Than Vitrified Pipe

FRANKLIN COUNTY, Ohio, commissioners have decided that hereafter all specifications for sewer contracts shall include vitrified as well as concrete sewer pipe as usable material.

This was decided following protests concerning the specifying of concrete pipe solely in the construction of a 42-in. sewer, 3500 ft. long, for which the commissioners received bids August 5.

County Sanitary Engineer Bradbury believes that concrete is better and probably cheaper for such a large sewer, county commissioners explained.

Prosecutor Hoskins also received protests against specifying concrete only in certain sewer contracts, but maintained it was a matter for commissioners to decide.—*Columbus* (Ohio) *Citizen.*

Organize Vermont Concrete Pipe Co.

PRELIMINARY STEPS toward bringing a new manufacturing industry to Montpelier, Vt., were taken August 1 with the filing of articles of association in the Secretary of State's office for the Vermont Concrete Pipe Co., Inc., which will have its headquarters at Montpelier. The papers are signed by Charles W. Maxwell of Slingerslands, N. Y., Frank H. Tracy and Peter Giulliani of Montpelier. It will have a capital of $10,000 and will manufacture and deal in concrete pipe. An announcement of the plans for operations will be made early next week, those connected with the new concern state. A proposal to issue 36 shares of stock for cash at the par value of $100 a share has been filed with the Secretary of State.—*Burlington* (Vt.) *Free Press.*

Building Central Mixing Plant in Baltimore

ANNOUNCEMENT that construction work will shortly be begun on a new central mixing plant for concrete to cost about $50,000 in East Baltimore, Md., was made July 27 by the Industrial Bureau of the Association of Commerce.

The concern is the Arundel-Brooks Concrete Corp. When completed, the plant will be the only one in operation in the city.

The plant's capacity will be 1000 cu. yd. per day. The concrete-mixer to be installed in the plant will have a 4½-yd. capacity.

Foundataions for the plant have been started on the property formerly occupied by the plant of the American Ice Co. It is expected that the plant will be ready for deliveries by October 1.

The officers of the new concern, just elected, are: Frank A. Furst, chairman of the board of directors; Walter B. Brooks, Jr., president; J. J. Hock, vice-president; S. Bonsal Brooks, vice-president, and Richard A. Froehlinger, secretary-treasurer.—*Baltimore* (Md.) *News.*

Ready-Mix Plant Opened in Indianapolis

A STEP IN THE ADVANCE of the concrete industry in Indianapolis, Ind., has been marked with the founding of the Ready-Mixed Concrete Corp., which started operations recently.

E. A. Hagy is the company's concrete engineer and he supervises all its mixing.

When the concrete is mixed it is loaded in 4-yd. agitators. The capacity of the plant is 600 cu. yd. daily. The company will have ten agitator trucks in operation.

Ernest Horne, salesmanager, said the company is providing concrete for a new runway and bleachers under construction at the municipal airport. State highway jobs also are handled by the corporation. Harvey A. Tutewiler is president of the company.—*Indianapolis* (Ind.) *News.*

Northwest Concrete Products Association Meets

WHILE membership atttendance was light at the midsummer meeting of the Northwest Concrete Products Association held at Gearhart, Ore., July 17 and 18, much interest was shown in methods of promotion of sales engineers in the field. It may be stated that the conference resulted in a better understanding among the plant groups and a crystallization of ideas.

Pennsylvania Limestone Companies in Merger

AN IMPORTANT MERGER of the limestone industry of this part of Pennsylvania has been completed. The Mercer Lime and Stone Co., with plant at Branchton, of which S. S. Smith is the manager, has acquired the Climax Lime and Stone Co., with plant at Wick, and has combined the business of the two plants. The product of both plants is hydrated lime, lump lime and ground burnt lime used solely for agricultural purposes.

These are two of the oldest established quarries in this part of the state. The Wick plant was opened more than 40 years ago.

The Branchton plant was opened in 1903 and has changed hands a number of times since. Three years ago Mr. Smith became its principal owner and manager.

The company has been enjoying a prosperous business, catering exclusively to the agricultural demands. It has built up a large business with the farmers of this part of the state, making deliveries both by railroad and trucks.

By the acquisition of the Wick plant the company will be in a position to meet all demands of the trade.—*Butler* (Penn.) *Eagle*.

Iowa Producer to Make Plant Improvements

THE Dubuque Stone Products Co., Dubuque, Ia., recently purchased the Iowa Fuel and Gravel Co., and is to make improvements to its floating, storage and loading plant when the Mississippi river dredging season is at an end, according to Paul M. Nauman, secretary and treasurer of the company.

A 20-ton scale is being installed at the main offices of the company on Garfield avenue and will serve as main office scales for the two plant units. Between $10,000 and $15,000 will be expended on revamping conveyors, hoppers and other gravel equipment at the Fourth street extension station. Either gravel measuring, or weighing equipment is to be installed this winter. Two new barges have been purchased and other floating equipment is contemplated.

Alpena Gravel Co. Files Notice of Appeal

THE Detroit and Mackinac railway and the Alpena Gravel Co. filed full notice of appeal in circuit court recently in the case brought against them by the Federal Gravel Co. and the Michigan Gravel Co. asking that the bill of complaint and intervening petition be dismissed, with costs. At a recent court session, the court decreed a provision enjoining the defendant, the D. and M. R. R., from selling its surplus sand and gravel commercially.—*Bay City* (Mich.) *Times*.

Tunnel Blast

AT THE CHESHIRE, Conn., quarry of the York Hill Trap Rock Co. an effective and satisfactory tunnel blast was shot recently, according to *The Explosives Engineer*.

For some years it has been the practice to blast a year's supply of rock with a single shot. This year's shot is estimated to have blasted down 100,000 tons of rock with a charge of 14,000 lb. of explosive.

During the winter a tunnel 3 ft. wide by 4 ft. high was driven back a distance of 50 ft. from the foot of the ledge and then parallel to the face 50 ft. in one direction and 30 ft. in the opposite direction.

Hercomite explosive was used for the greater part of the charge and Gelamite A where water was encountered. Two No. 6 electric blasting caps were used in each priming cartridge which was placed in the center of each of the six charges. Two separate electric circuits were used and the wires suspended from the roof in order to reduce the chance of a broken circuit.

Each blasting cap was tested with a galvanometer before it was used and the circuits were also frequently tested in the same way during the loading operation to insure against broken wires.

The charges were tamped and stemmed with rock screenings, stemming being used to the mouth of the tunnel. A 550-volt line was used for firing the charges.

Expanding Rock Asphalt Market

EUGENE DAVIS of the Marble Cliff Quarries Co., Columbus, Ohio, believing there is a demand for a tennis court that will turn water and be usable after a heavy rain, has experimented with Scioto rock asphalt, a Marble Cliff product.

The first courts of Scioto rock were installed at St. Mary's of the Springs. During the past 12 months they have proven satisfactory, according to a recent article in the *Columbus* (Ohio) *State Journal*. A more severe test, however, due to the greater number of players using the courts, are the ones situated in the Upper Arlington municipal playground.

Highway Guard Rails

BULLETIN 19 has recently been issued by the American Road Builders Association. This bulletin is a reprint of the report of the general equipment committee of the Association as finally approved, presented and incorporated in the Convention Proceedings for 1931. Some information is given on boulder guard rails, stone wall guard rails and applications of concrete posts as guard rails.

Basic Dolomite, Inc. Announced

ANNOUNCEMENT is made of the merger of Basic Products Co. and Dolomite, Inc. According to a statement by H. P. Eells, Jr., president, the organization is as follows: George S. Davison, chairman of the board; Dan P. Eells, chairman of the executive committee; H. P. Eells, Jr., president; Samuel Eells, vice-president; Allen S. Davison, vice-president; J. E. Heidgen, secretary; W. P. Kelly, treasurer.

The company will continue to manufacture the products of both companies except cement and lime, the Basic Products Co. maintaining the manufacture of these products at its plant in Kenova, W. Va., this company having changed its name to the Green Bag Cement Co., as was announced in Rock Products, June 20. Mr. Eells says it is the purpose of this consolidation to furnish the trade the combined experience in the manufacture of dolomite products and refractory materials of the Basic Products Co., Kennedy Refractories Co. and Dolomite, Inc., the Kennedy company having previously been taken over by Basic Products Co.

The main offices of Basic Dolomite, Inc., are 1510 Hanna Bldg., Cleveland, Ohio. The plants of the company are located at Maple Grove, Ohio, Bettsville, Ohio, and Plum Run, Ohio.

Blast Damages Iowa Sand Plant

POLK COUNTY, Ia., bloodhounds were pressed into service August 5 in an effort to track persons who placed a charge of dynamite at the Doty Sand and Gravel Co. plant at Commerce, Ia.

The blast, which deputy sheriffs estimated was caused by at least four sticks of dynamite, damaged part of the machinery in the plant, according to officials.

The dynamite was discharged five minutes before three workmen arrived at the plant to start work on the night shift.

Bloodhounds took up the trail at the damaged sand pump and followed it to a nearby road, where the dynamiters are believed to have entered an automobile.

Two posts that support part of the pumping equipment and part of the sills were damaged by the blast, according to officials. They pointed out that the blast had been improperly placed and therefore caused comparatively small damage. Had it been properly placed, it would have wrecked the plant, according to deputy sheriffs.

The damage was repaired and operation was resumed immediately while officials of the company and deputy sheriffs continued their investigation. Several suspects were questioned during the day.

Company officials said a blast of some kind had occurred about midnight near the plant but that they knew nothing about it. —*Des Moines* (Ia.) *Tribune-Capital*.

Current Prices of Ready-Mix Concrete

AMARILLO, TEX.—Prices per cu. yd.*

Lime Mortar Mix		Terrazzo Mix	
1–4	6.50	1–3 –0	9.75
1–4½	6.25	1–3½–0	9.25
1–5	6.00	1–4 –0	8.75
		1–4½–0	8.50
		1–5 –0	8.25

Topping Mix		Base—Strength	
1–1 –0	14.00	4000 lb. per sq. in.	10.00
1–1½–0	13.00	3500 lb. per sq. in.	9.50
1–2 –0	12.00	3000 lb. per sq. in.	9.25
1–2½–0	11.50	2500 lb. per sq. in.	9.00
1–3 –0	11.00	2000 lb. per sq. in.	8.75
1–3½–0	10.50	1500 lb. per sq. in.	8.50

Base Mix		Mix	
1–2 –3½	9.50	1–3 –5	8.25
1–2¼–4	9.25	1–4 –6	7.75
1–3½–4½	8.25		

*For orders of 50 cu. yd. or more, prices are 75c less per cu. yd. than quoted. Free delivery within city limits for 2 cu. yd. or more per load; $1.00 per load extra for less than 2 cu. yd. loads, except to finish a job. Additional charge of 10c per mile per cu. yd. for deliveries outside of city limits.

BELLINGHAM, WASH.—Prices per cu. yd.¶

Mix	Retail, f.o.b. bunkers	In carloads	Mix	Retail, f.o.b. bunkers	In carloads
1–3–4	6.85	6.10	1–2–3	7.85	6.91
1–3–5	6.51	5.75	1–2–4	7.27	6.50

¶Additional charges for delivery to various zones. First zone, added charge of 75c per cu. yd.; second zone, added charge of $1.05; third zone, added charge of $1.40; fourth zone, added charge of $1.75.

BOSTON AND CAMBRIDGE, MASS.—Base price per cu. yd.‡

Mix		Mix	
1–2– 4 (3 to 30 cu. yd.)	**10.00**	1–2– 3 (30 cu. yd. and over)	8.20
1–2 –4 (30 cu. yd. and over)	**7.75**	1–1½–3 (3 to 30 cu. yd.)	10.55
1–3 –6 (3 to 30 cu. yd.)	**9.50**	1–1½–3 (30 cu. yd. and over)	8.30
1–3 –6 (30 cu. yd. and over)	**7.25**	1–1–2 (3 to 30 cu. yd.)	11.30
1–2½–5 (3 to 30 cu. yd.)	**9.75**	1–1–2 (30 cu. yd. and over)	9.05
1–2½–5 (30 cu. yd. and over)	**7.50**	1–2 (3 to 30 cu. yd.)	13.00
1–2 –3 (3 to 30 cu. yd.)	**10.45**	1–2 (30 cu. yd. and over)	10.75

‡Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid on or before the 25th and on deliveries made between 15th and 30th if paid on or before the 10th of following month.

CHAMPAIGN, ILL.—Prices per ton†

Mix		Mix	
1–2–3	5.25	1–2–4	4.75
1–3–5	4.50		

†5% trade discount to contractors. Prices to both contractor and consumer subject to cash discount of 5% for payment by 10th of month following delivery.

CLEVELAND, OHIO—Prices per cu. yd. to contractors for orders of 2 cu. yd. or more (a); Public Square basing point.

Mix		1st mile	2nd mile	3d mile (Maximum)
1–1 –2		7.50	7.75	8.00
1–2 –3		6.30	6.55	6.80
1–2 –4		6.00	6.25	6.50
1–2½–3½		6.00	6.25	6.50
1–2½–4		5.80	6.05	6.30
1–3 –4		5.70	5.95	6.20
1–2½–5		5.60	5.85	6.10
1–3 –5		5.50	5.75	6.00
1–3 –6		5.40	5.65	5.90
1–4 –8		5.25	5.50	5.75
1–2	Finish	7.50	7.75	8.00
1–2½	Finish	7.00	7.25	7.50
1–3	Finish	6.50	6.75	7.00

(a) Industrials or consumers 50c more than contractors. Extra charge for concrete delivered nights, Sundays or holidays, $1.00 per cu. yd. over daytime schedule. For "Velo" or "Incor" additional charge of $2.00 per cu. yd. For waterproof or plastic cements, additional charge of $1.25 per cu. yd. For orders less than 2 cu. yd. add $1.00 per yd. to above prices. Prices quoted are based upon normal discharge of load within 20 minutes after arrival of truck. A demurrage charge of $1.00 for each 15 minutes thereafter.

DALLAS, TEX.†

	Slump				Slump		
Strength	½ in. to 1 in.	3 in. to 4 in.	6 in. to 7 in.	Strength	½ in. to 1 in.	3 in. to **4 in.**	6 in. to **7 in.**
1500	6.00	6.20	6.60	2500	6.55	6.75	7.15
2000	6.30	6.40	6.80	3000	6.90	6.10	7.50

Fixed Mixes (any slump)

1–2½–5	7.20	1–2–4	7.50	1–1½–3	8.20

†Prices subject to 2% 15 days and are based on quantities of 50 to 999 cu. yd. and on delivery in 2½-cu. yd. loads within Zone 1, which extends about 1½ miles from either of two plants. Zone charges are approximately 10c per cu. yd. per mile beyond the Zone 1 limit. On quantities under 50 cu. yd. add 20c and on quantities over 1000 cu. yd. deduct 30c.

COLUMBUS, OHIO—Delivered prices per cu. yd.

	Zones§									
Mix	1	2	3	4	5	6	7	8	9	10
1–1½–3	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45	8.65	8.85
1–2 –3	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45	8.65
1–2 –3½	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45
1–2 –4	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25
1–2½–4	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75	7.95	8.15
1–3 –4	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05
1–2½–5	6.15	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75	7.95
1–3 –5	6.05	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85
1–3 –6	5.95	6.15	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75
1–4 –8	5.85	6.05	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65
1–2	9.55	9.75	9.95	10.15	10.35	10.55	10.75	10.95	11.15	11.35
1–3	7.95	8.15	8.35	8.55	8.75	8.95	9.15	9.35	9.55	9.75

§All zones radiating from center of city. Zone 1 is one mile in radius, zone 2 is two miles in radius, zone 3 is three miles in radius, etc. Discount of 25c per cu. yd. allowed for payment 10th of month following delivery date. For orders over 50 cu. yd. a deduction of 25c per cu. yd. is allowed. Orders of less than 2 cu. yd. carry same haul charge as 2 cu. yd. load. Orders for 2 cu. yd. or over delivered in full loads at 2 yd. or more. No extra charge made for finishing load if less than 2 cu. yd.

DES MOINES, IOWA—Prices per cu. yd. (b)

(Made with ¾-in. gravel for structural work)

		Plant	Zone			
Mix	Slump	price	A	B	C	D
1–2½–5	2-in.	6.00	6.50	6.75	7.00	7.25
1–2½–5	6 in.	6.25	6.75	7.00	7.25	7.50
1–2 –4	2 in.	6.50	7.00	7.25	7.50	7.75
1–2 –4	6 in.	6.75	7.25	7.50	7.75	8.00
1–2 –3½	2 in.	7.00	7.50	7.75	8.00	8.25
1–2 –3½	6 in.	7.25	7.75	8.00	8.25	8.50
1–2½–3	2 in.	7.50	8.00	8.25	8.50	8.75
1–2½–3	6 in.	7.75	8.25	8.50	8.75	9.00

(Made with pea gravel for cellar and sidewalks)

		Plant	Zone			
Mix	Slump	price	A	B	C	D
1–2½–5	2 in.	5.75	6.25	6.50	6.75	7.00
1–2½–5	6 in.	6.00	6.50	6.75	7.00	7.25
1–2 –4	2 in.	6.25	6.75	7.00	7.25	7.50
1–2 –4	6 in.	6.50	7.00	7.25	7.50	7.75
1–2 –3½	2 in.	6.75	7.25	7.50	7.75	8.00
1–2 –3½	6 in.	7.00	7.50	7.75	8.00	8.25
1–2½–3	2 in.	7.25	7.75	8.00	8.25	8.50
1–2½–3	6 in.	7.50	8.00	8.25	8.50	8.75

(b) Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid before the 25th and on deliveries made between 16th and 30th if paid before the 10th of following month. Quick setting $2.00 per cu. yd. extra; waterproofing, $2.00 per cu. yd. extra. Each zone approximately one mile.

FAIRMONT, W. VA.—Prices per cu. yd. (c)

Mix	Quantity	Delivered	Called for
1–2–4	Less than 1 cu. yd.	11.00	10.00
1–2–4	From 1 to 4 cu. yd.	10.00	9.00
1–2–4	From 5 to 10 cu. yd.	9.50	8.50
1–2–4	From 11 to 49 cu. yd.	9.00	8.00
1–2–4	From 50 cu. yd. and up	8.50	7.50

(c) For 1–2–3 mix add 50c per cu. yd. to prices quoted; for 1–3–5 mix deduct 50c per cu. yd. from prices quoted.

HARTFORD, CONN.—Prices per cu. yd. delivered.

Mix			Mix		
1–2–4	(d)	6.25	1–2–0 finish		12.00
1–3–5	(d)	5.90			

(d) Placing, $1.00 per cu. yd. extra.

INDIANAPOLIS, IND.—Prices per cu. yd. in small quantities, for delivery within 3-mile haul.

Mix	
1 bbl. cement/cu. yd. concrete	5.50
1¼ bbl. cement/cu. yd. concrete	6.00
1½ bbl. cement/cu. yd. concrete	6.50

MILWAUKEE, WIS.—Prices per cu. yd. (e)

		Slump		
28-day breaking strength:	Per sq. in.	2 to 4 in.	4 to 6 in.	6 to 8 in.
Garage footings and walls	2000 lb.	7.00	7.40	7.80
Footings, floors, walls	3000 lb.	7.50	7.90	8.30
City paving	3300 lb.	7.75	8.00	8.40
Sidewalks, curbs	4000 lb.	8.25	8.75	9.25
24-hour high early strength	5000 lb.	10.00	10.50	11.00

Sold on old mixture method, 2- to 4-in. slump; 4- to 6-in. slump; 6- to 8-in. slump.

	Mix	
Walls—Garage footing	1–3–5	7.00
City paving	1–2–4	7.50
Garage floors, walls	1–3–3	7.50
Sidewalk	1–2–3	8.00
Special strength (machine bases)	1–1¼–2½	9.50
Facing	1–3	10.50
Facing	1–2	12.00

(e) Discount of 25c per cu. yd. if paid by 10th of following month.

LOS ANGELES, CALIF.¶—Prices per cu. yd.

Mix	1 to 5 yd.	5 to 25 yd.	25 or more
3–50–50	8.25	7.25	6.25
4–50–50	8.85	7.85	6.85
1–3 –6	8.95	7.95	6.95
1–3 –5	8.95	7.95	6.95
1–2½–5	9.50	8.50	7.50
1–3 –4	9.75	8.75	7.75
1–2¾–3½	10.00	9.00	8.00
1–2 –4	9.85	8.85	7.85
1–2½–3½	10.10	9.10	8.10
1–2½–3¼	10.05	9.05	8.05
1–2 –3	10.60	9.60	8.60
1–2 –3½	10.20	9.20	8.20

¶Above prices for deliveries in Zone 1 (1-5 miles). Added charge of 75c per cu. yd. for deliveries in Zone 2 (5 to 10 miles). Added charge of $1.50 for Zone 3 (10 to 15 miles). Discount of 50c per cu. yd. if payment is made within 10 days from delivery.

MEMPHIS, TENN.—Prices per cu. yd. delivered in city.†

Strength	With gravel aggregate	With stone aggregate	Strength	With gravel aggregate	With stone aggregate
4000 lb.	11.00	11.18	2000 lb.	8.00	8.40
3500 lb.	9.50	9.84	1800 lb.	7.30	8.25
2800 lb.	8.70	9.35	1600 lb.	7.10	8.05
2400 lb.	8.40	8.78			

†For del'y. outside city, price is 30c cu. yd. over above prices for each mile.

MONTGOMERY, ALA.—Prices per cu. yd. delivered in city limits. (g)

Mix		Mix	
1–2 –4	6.25	1–3–6	5.60
1–2½–5	5.85	1–2 mortar topping	11.00

(g) Discount of 25c per cu. yd. for payment in 30 days. Special quotations for quantity orders.

MORGANTOWN, W. VA.—Prices for jobs of 1 to 10 cu. yd., delivered (f)

Mix		Mix	
1–2–3	9.50	1–2½–4	8.90
1–2–4	9.00	1–2½–5	8.50

(f) Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

NEW ORLEANS, LA. (h)—Plant prices per cu. yd. for 30 yd. or less.

Mix	Cement: Portland	Cement: "Incor"	Mix	Cement: Portland	Cement: "Incor"
1–4 –8	5.15	6.10	1–2–2	7.70	10.25
1–3 –6	5.75	7.00	2–3–6	8.05	10.55
1–3 –5	5.95	7.35	2–3–3	8.85	12.00
1–2½–5	6.25	7.80	1–1½ topping	10.95	15.80
1–2½–4	6.40	8.15	1–2 topping	9.30	13.25
1–2 –4	6.75	8.60	1–3 topping	7.85	10.85
1–2 –3	7.20	9.40			

Plant prices per cu. yd., 30 cu. yd. or over:

Mix	Cement: Portland	Cement: "Incor"	Mix	Cement: Portland	Cement: "Incor"
1–4 –8	4.65	5.45	1–2–2	6.95	9.15
1–3 –6	5.15	6.25	2–3–6	7.25	9.45
1–3 –5	5.35	6.55	2–3–3	8.00	10.70
1–2½–5	5.65	7.00	1–½ topping	9.85	14.10
1–2½–4	5.80	7.25	1–2 topping	8.40	11.80
1–2 –4	6.05	7.70	1–3 topping	7.05	9.60
1–2 –3	6.50	8.40			

(h) All prices subject to 5% 15 days, 30 days net. Haulage based on various zones.

NEWARK AND HARRISON, N. J.§

1–2 –4	9.50	1–3 –6	8.50
1–3 –5	9.00	1–2½–5	9.25

§Discount of 2% if paid by 10th of month following delivery.

PUEBLO, COLO.—Prices per cu. yd.‖

Strength	Zone 1	Zone 2	Zone 3
3000 lb.	8.00	8.40	8.80
2700 lb.	7.75	8.15	8.55
2400 lb.	7.50	7.90	8.30
2100 lb.	7.10	7.50	7.90
1500 lb.	6.50	6.90	7.30
1200 lb.	6.50	6.90	7.30

‖On larger quantities to contractors, deduct 50c per cu. yd.

ROCHESTER, N. Y.—Prices per cu. yd.

Mix	Plant price	Prices for delivery to various zones: Zone 1	2	3	4	5	6	7
1–2 –3	7.00	7.75	7.90	8.05	8.20	8.35	8.50	8.65
1–2½–3½	6.55	7.30	7.45	7.60	7.75	7.90	8.05	8.20
1–3 –4½	6.20	6.95	7.10	7.25	7.40	7.55	7.70	7.85
1–4 –5	6.00	6.75	6.90	7.05	7.20	7.35	7.50	7.65
1–5 –6	5.65	6.40	6.55	6.70	6.85	7.00	7.15	7.30

ST. PAUL, MINN.—Prices per cu. yd. delivered within three miles of plant. (m)

1–2–4 mix	6.75	1–3–5 mix	6.30

(m) For greater distances of haul, increase of 10c per cu. yd. per mile.

PITTSBURGH, PENN.—Range of prices, according to zone, for ready-mixed concrete. Prices per cu. yd. delivered, up to 200 cu. yd. (j)

Mix	Strength	
1–1½–2½	4000 lb.	8.60– 9.70
1–2 –3	3500 lb.+	8.25– 9.35
Class A	3500 lb.	8.10– 9.30
1–2½–3½	3000 lb.+	8.00– 9.20
1–2 –4 Class B	3000 lb.	7.90– 9.10
1–2½–4½	2500 lb.+	7.75– 8.95
1–2½–5	2500 lb.	7.60– 8.80
1–3 –5	2000 lb.	7.50– 8.70
1–3 –6	1500 lb.	7.40– 8.55

Prices per cu. yd. delivered, over 200 cu. yd. (j)

Mix	Strength	
1–1½–2½	4000 lb.	7.60– 9.45
1–2 –3	3500 lb.+	7.25– 9.10
Class A	3500 lb.	7.10– 8.95
1–2½–3½	3000 lb.+	7.00– 8.85
1–2 –4 Class B	3000 lb.	6.90– 8.75
1–2½–4½	2500 lb.+	6.75– 8.60
1–2½–5	2500 lb.	6.60– 8.45
1–3 –5	2000 lb.	6.50– 8.35
1–3 –6	1500 lb.	6.40– 8.20

(j) Class A concrete is a special concrete prepared for the city of Pittsburgh. Plus indicates the strength shown is the minimum strength. Dealer's commission of 50c per cu. yd. allowed in all zones with exception of Yellow Zone. No commission allowed over 200 cu. yd. Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

SAN ANTONIO, TEX.—Prices per cu. yd. on city deliveries.‡

Mix		Mix	
1–3–5	7.00	1–2–4	7.50

‡Deduction of 50c per cu. yd. on large orders for delivery within one mile of plant.

SAN JOSE, CALIF.—Prices per cu. yd. delivered within one mile of plant. (k)

Mix	Up to 5 cu.yd.	Over 5 cu.yd.	Mix	Up to 5 cu.yd.	Over 5 cu.yd.
1–6	9.00	8.50	1– 9	8.00	7.50
1–7	8.50	8.00	1–12	7.00	6.50

(k) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SANTA CRUZ, CALIF.—Price per cu. yd. delivered within two-mile radius of plant. (l)

Mix	Over 5 cu.yd.	Less than 5 cu.yd.	Mix	Over 5 cu.yd.	Less than 5 cu.yd.
1–6	9.00	9.50	1–8	8.10	8.60
1–7	8.50	9.00	1–9	7.90	8.40

(l) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SPRINGFIELD, ILL.—Prices per cu. yd.

Mix		Mix	
1–3 –6	9.00	1–2 –3½	10.00
1–3 –5	9.20	1–2 –3	10.20
1–2½–4	9.45	1–1½–3	10.55
1–2 –4	9.75	1–1 –2	11.25

WATSONVILLE, CALIF.—Prices per cu. yd.‖

Mix		Mix	
1–6	9.90	1– 9	8.50
1–7	9.30	1–12	7.75
1–8	9.00		

‖Prices are for delivery anywhere within city limits, and are subject to cash discount of 50c per cu. yd. for payment in full on or before the 10th day of following month.

WILKES-BARRE, PENN.—Prices per cu. yd. delivered within one mile of plant, subject to discount of 25c per cu. yd. for payment within 10 days from date of delivery. Extra charge of 15c per cu. yd. for each additional mile.

Mix	Gravel	Stone	Mix	Gravel	Stone
1–2 –3	7.60	7.90	1–3–5	6.75	7.05
1–2 –4	7.30	7.60	1–3–6	6.75	7.05
1–2½–5	7.00	7.30			

City Sued by Gravel Company

CALLING on the city of Los Angeles, Calif., to pay $675,000 for "expected profits" from gravel pits outlawed by abatement and nuisance proceedings, the Los Angeles Rock and Gravel Co. recently sued the city for damages.

The plaintiff corporation quoted a lease made July 21, 1923, by which it was to take 900,000 yd. of gravel from pits in the Arroyo Seco. In December, 1923, the city obtained an injunction against further exploitation of the pits, on the ground that nearby property was being undermined, and city streets were being damaged.

On June 24, 1929, the California Supreme Court reversed the lower courts on the ground that there were technical errors in the injunction proceedings. Meanwhile, the gravel contract had expired, and has not been renewed. Profits at the rate of 75c a yd. are claimed.—*Los Angeles* (Calif.) *Times.*

Proceedings of Road School

MANY SUBJECTS of interest to the rock products industry were discussed at the 17th annual road school of Purdue University held January 19-23. The proceedings have recently been published.

Among those subjects discussed were "Crusher-Run Stone Roads," "Combination Stone and Gravel Roads," "Black Top Pavements," "Scientific Control of Street Paving Material," and "Surface Treated Gravel."

New Machinery and Equipment

Hydraulic Packing

A NEW PRODUCT, known as "Rubber Crimps," or "U" type hydraulic packing, for service on hydraulic rams and presses is announced by the Diamond Rubber Co., Akron, Ohio. The new packing is made in rings of standard sizes, with a U-shaped cross section. The rubber is said to be compounded to resist oil. It is covered with a layer of fabric.

The manufacturer says this packing is suitable for use with pressures up to 3,000 lb., is not affected by the heat generated in an hydraulic press, wears slowly and evenly, fits snugly against the ram at all times, will not dry up when a press is idle, is low in cost and can be furnished in any standard diameter.

●

Rake Type Sand Classifier

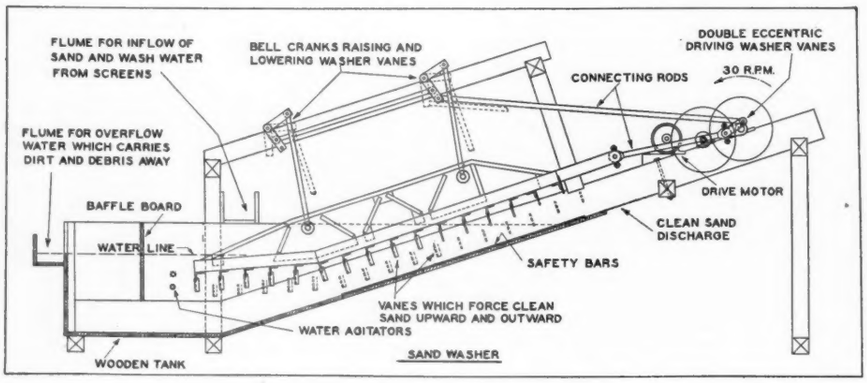
STEPHENS-ADAMSON Manufacturing Co. of Aurora, Ill., and Los Angeles, Calif., has developed a mechanical classifier for washing and dewatering sand in large quantities. The principle is simple and a high percentage of clean sand is saved, it is claimed.

Wash water, heavily charged with silt and sand, is sluiced directly from the final washing screens into the classifier tank. Being heavier, the sand is said to settle through the water to the bottom of the tank, leaving the dirt and debris in suspension to flow off with the waste water.

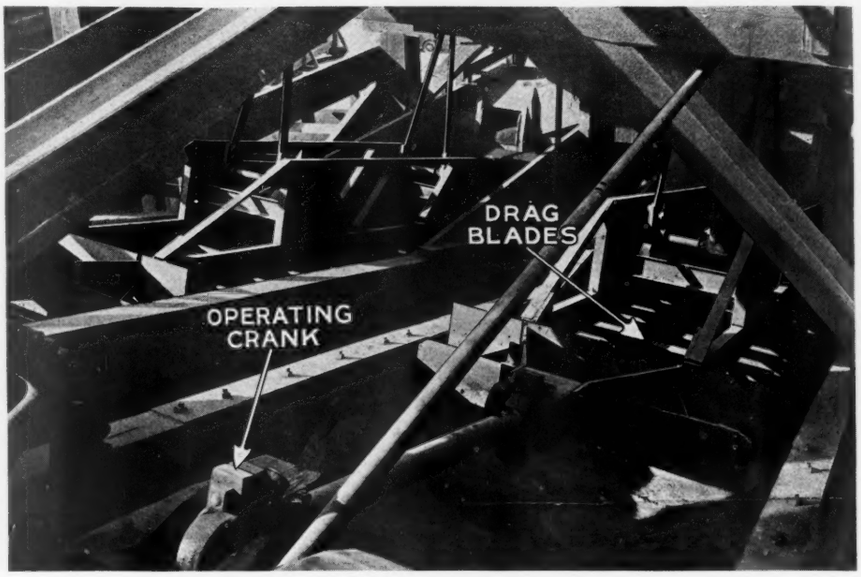
As the sand settles, a series of power driven paddles sink into the tank, push the sand up the sloping bottom, lift and return to repeat the cycle. According to the manufacturer the sand in being pushed up and out of the water is rolled over and over and washed clean. The water drains back into the tank and the clean, dewatered sand is pushed up to the discharge point.

Due to the combined churning action of the sand and water flowing into the tank, the reciprocating action of the paddles and agitating jets of clean water through the bottom of the tank, the sand discharged is said to be thoroughly cleaned. The intermittent action of the paddles also aids the dewatering process.

This classifier is made in widths of from 36-in. to 72-in. and from 17 ft. to 19 ft. long. Capacities are said to range from 40 to 100 tons per hr.


FLUME FOR INFLOW OF SAND AND WASH WATER FROM SCREENS
BELL CRANKS RAISING AND LOWERING WASHER VANES
DOUBLE ECCENTRIC DRIVING WASHER VANES
CONNECTING RODS
30 R.P.M.
FLUME FOR OVERFLOW WATER WHICH CARRIES DIRT AND DEBRIS AWAY
DRIVE MOTOR
BAFFLE BOARD
CLEAN SAND DISCHARGE
WATER LINE
SAFETY BARS
VANES WHICH FORCE CLEAN SAND UPWARD AND OUTWARD
WATER AGITATORS
SAND WASHER
WOODEN TANK

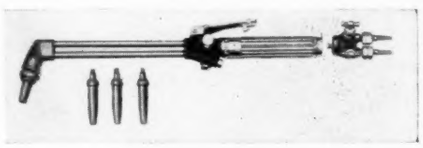
Mechanism of rake type classifier



Drag blades rake clean sand upward

Cutting Apparatus

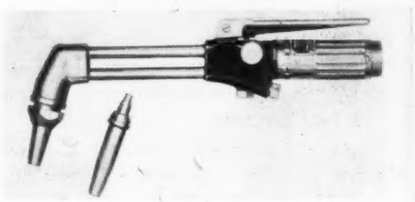
THE Linde Air Products Co., New York, N. Y., has recently added a cutting blowpipe and cutting attachment to its new line of Prest-O-Weld medium-pressure apparatus of the detachable valve body design. The new cutting apparatus includes the Prest-O-Weld Type C-105 cutting blowpipe and the Prest-O-Weld Type CW-105 cutting attachment.



Cutting blowpipe

It is said these two types of cutting apparatus, together with the Types W-105 and W-106 welding blowpipes previously announced, can all be used interchangeably with the same detachable valve body. By means of the detachable valve body, the operator can change from a full size welding blowpipe to a smaller welding blowpipe, to a full size cutting blowpipe, or to a cutting attachment without detaching the hose or hose connections and without the use of a wrench, it is claimed.

The manufacturer states pressure forgings



Cutting attachment

are used in the construction of the blowpipe head, cutting valve body and lever. The cutting oxygen tube is made of Ambrac, a special hard brass, to afford stiffness.

According to the manufacturer, the Prest-O-Weld Type CW-105 Cutting Attachment will cut metal up to 2 in. in thickness.

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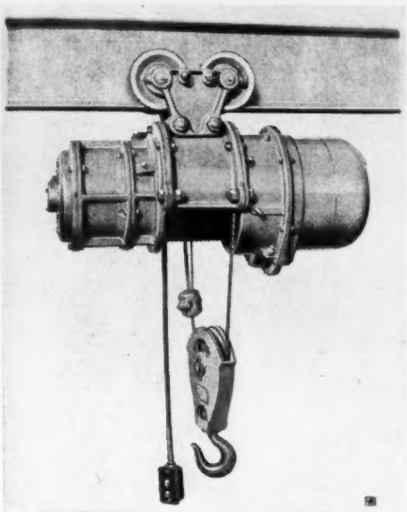
Announce New Line of Hoists

THE NEW LINE of trolley hoists is announced by the Wright Manufacturing Co., Bridgeport, Conn., and is said to consist of the plain, geared, and motor driven trolley types.



Variable speed can be provided

In the motor driven trolleys, the wheels are driven on each side of the I-beam and are equipped with a safety stop. Controllers for single speed, two speed, or variable speed can be furnished, the manufacturer states.

While the standard lift is 18 ft., lifts of 9 and 36 ft. can also be furnished.

•

Gas-Electric Locomotive Dump Car

A DEVELOPMENT has recently been announced by the Differential Steel Car Co., Findlay, Ohio. Essentially it consists of a locomotive chassis with a dump body mounted on it. It is a self-contained unit carrying its own power plant. This locomotive is intended for service in open pit mining and quarry work and in industrial plants.

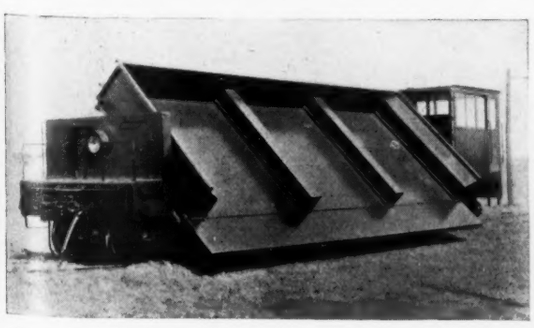
This is said to be an economical self-propelled vehicle for operations such as stripping overburden and similar operations where it would not be desirable to set poles and string trolley wire or to provide substation facilities.

This gas-electric locomotive has a 24-yd. level load dump body on it. The equipment weighs 45 tons light and 80 tons loaded. Truck center distance is 29 ft. and wheel center 5 ft. 6 in.

Essentially this particular equipment is said to consist of a double power plant equipment mounted on a sling between the sills consisting of 2 Buda type JH-6 gasoline engines each rated at 155-hp., at 1200 r.p.m., two generators Westinghouse Type 180-D-5, four Type 908-RH motors and the necessary control apparatus for convenient and efficient operation of this combination equipment.

According to the manufacturer, this double power plant equipment will produce a maximum tractive effort of 36,000 lb. and will have a free running speed of 19 mi. per hr. light.

The manufacturer claims the equipment has a number of advantages in that it is flexible in operation, it is easily handled by the operator, it is economical to operate, and maintenance is not great.



Double power plant is used

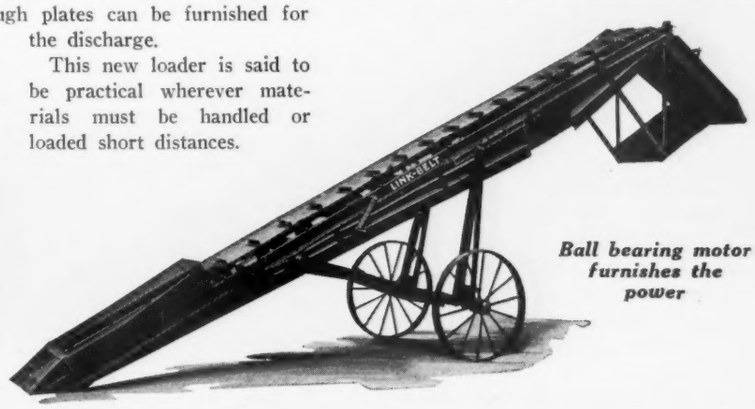
•

Light Weight Portable Loader Announced

THE NEW "Cub" recently announced by the Link-Belt Co., Chicago, Ill., is said to be lighter by 100 lb. than the previous model which it supersedes. Added features claimed for this new "Cub" are Link-Belt 18-in. "Service" conveyor belt, troughing rolls with roller bearings, all bronze bushed shaft bearings, ball bearing type electric motor and Alemite lubrication throughout.

A crank operates a self-locking worm and wheel for raising and lowering conveyor height. For special purposes, hinged trough plates can be furnished for the discharge.

This new loader is said to be practical wherever materials must be handled or loaded short distances.

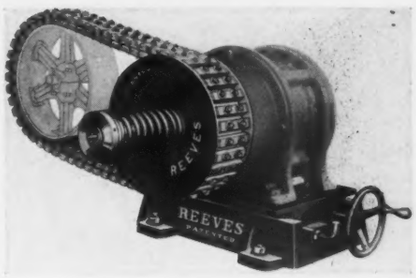


Ball bearing motor furnishes the power

Variable Speed Motor Pulley

A NEW TYPE of variable speed unit is announced by the Reeves Pulley Co., Columbus, Ohio.

It is said to be directly mounted on the motor shaft and forms the driving element between the motor and the driven shaft.



Mounted direct on motor

According to the manufacturer the speed control is infinite between a ratio limitation of 3:1. It is said to transmit from fractional to 7½-hp. Speeds are adjusted by turning a handwheel and any speed within the range may be secured and maintained, it is said.

This unit is built in six sizes and is applicable to any standard alternating or direct current motor of these sizes.

•

Welding Sets

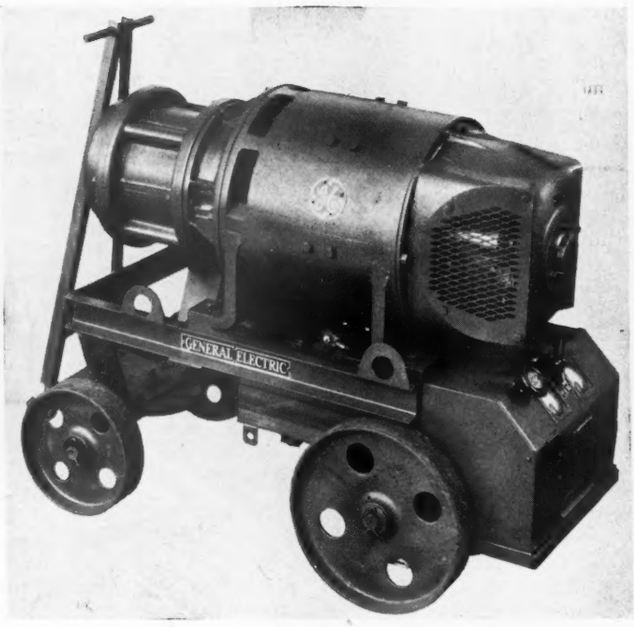
THE General Electric Co., Schenectady, N. Y., announces a new line of single-operator welding sets. This has been designated the WD-20 line and covers the 100-, 200-, 300-, 400- and 600-ampere ratings respectively.

It includes both portable and stationary sets, the basic form being stationary with but a slight change needed to make it portable. Types include those for operation on either alternating or direct current at all standard voltages and standard frequencies. Gasoline-engine-driven sets will also be available, it is announced.

Advantages of the line are said to include the use of two-bearing construction on the alternating current types up to 600 amperes; compactness and light weight; and improved welding characteristics. The sets are said to be self-excited with

a tapped series field for major current adjustments and a shunt field rheostat giving duplex voltage control.

A typical a-c set consists of a generator with an overhung driving motor mounted on a simple base to which is attached a strong sheet-metal control cabinet enclosing the generator control devices, meters and motor starting equipment. A specially designed transformer-reactor is mounted in the base under the generator. Base supports are arranged to be bolted to the floor or to have axles and wheels readily attached. The whole assembly occupies a minimum of space, a typical 300-ampere, a-c set standing 36 in. high and 50 in. long by 23 in. wide.



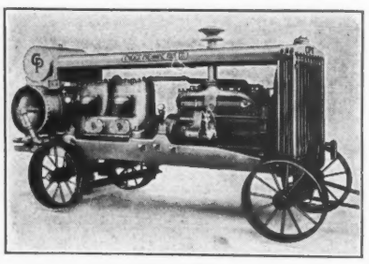
Few changes needed to convert this welding set from stationary to portable

Improvements claimed by the manufacturer are practically instantaneous voltage recovery from short circuit to nearly full open circuit voltage; duplex voltage control by the operator over a wide range with the provision of a surplus voltage which can be used when it is necessary to use very long welding leads, and simplicity of operation.

●

Portable Compressor

A PORTABLE COMPRESSOR of 360 cu. ft. per min. capacity permitting the use of an additional number of rock drills, pavement breakers, clay diggers and similar pneumatic tools is announced by the Chicago Pneumatic Tool Co., New York, N. Y.



Force lubrication of engine and compressor

According to the manufacturer vibration has been eliminated, full force lubrication of both engine and compressor is used, counterweights are forged integral with compressor crank-shaft, full-floating piston pins are used in the compressor, cylinders are cast separately from the crankcase, a sectionalized radiator with steel protection bars and fan guard are employed, and a one-piece cast steel deck has been adopted.

The equipment is available with steel wheels, rubber-tired wheels, CP trailer or semi-portable skid mounted.

●

New Dragline Bucket

A NEW DRAGLINE bucket is being marketed by the Erie Steel Construction Co., Erie, Penn., for which many features are claimed. It is said the bucket is light in weight yet sturdy in construction. The manufacturer states the center of gravity is located with relation to the hoist trunnion brackets so that at all stages of operation the bucket is well balanced.

The bridge is built to keep the sides from pulling in. It ties in with the lip and side plates. Hitch plates are steel castings overlapped by reinforcing plates and angles and are interlocked with the base of the bridge and the ends of the lip.

Corner connections are flanged. Rivets are used throughout. A one-piece back band is tied into the bridge and welded and riveted to the side plates.

Bridge is built to keep the sides from pulling in

The drag chain is made up of electric welded links and is provided with a socket for the drag cable and a guard to the fair-lead sheave.

Alloy-steel, renewable, reversible teeth and alloy-steel, heat-treated lips are regular equipment.

The bucket comes complete with chains ready for attaching to the dragline machine.

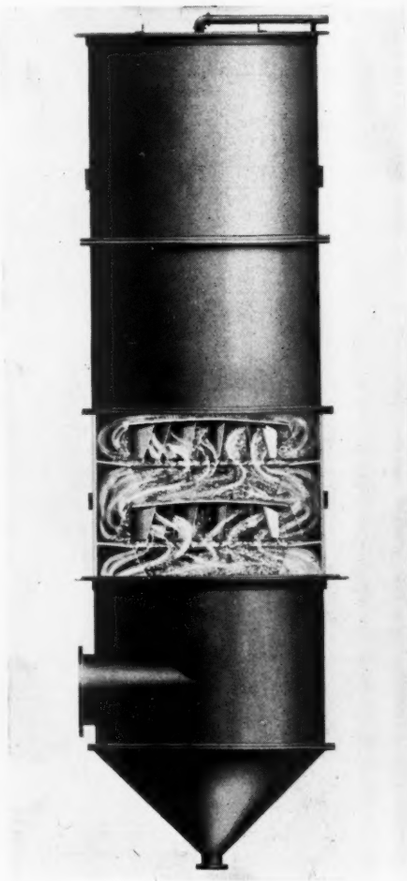
●

Dust Collector

A NEW WET TYPE dust collector has recently been announced by Claude Schneible, Chicago, Ill.

It is said the new Multi-wash dust collector has been simplified to eliminate all moving parts, spray nozzles, pockets and dead zones.

Dust laden air, vapors, gases or other products to be cleaned or recovered are said to be introduced at the bottom of the tower and at a tangent to the periphery. Water or other liquid cleaning or absorbing media introduced at the top of the tower is said to fall in a spray through succeeding plates of the tower, giving an intense, intimate contact with the upward moving air or vapor which has continued to spiral in its course due to the vanes in each plate. There are two washes per plate and standard equipment provides six



Moving parts are eliminated

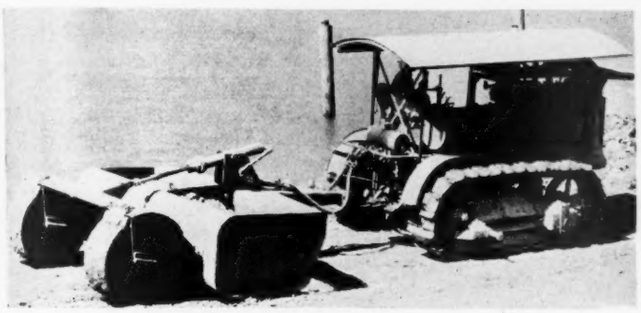
plates or 12 washes. Clean air escapes from the top of the tower and can be returned into the plant or exhausted into the atmosphere.

According to the manufacturer these Multi-wash dust collectors are adapted to use in plants where dust falling outside becomes an evil and for use with ash conveying systems, cement, coal dust or wherever usable vapors or any valuable materials held in suspension should be recovered to prevent costly losses.

•

Hydraulic Dirt Mover

THE BLAW-KNOX CO., Pittsburgh, Penn., announces it now manufactures and sells the "Ateco" hydraulic dirt mover east of the Rocky mountains and in foreign countries. In the rock products industry these movers should be useful in stripping operations.



Will cut any depth to 1 ft.

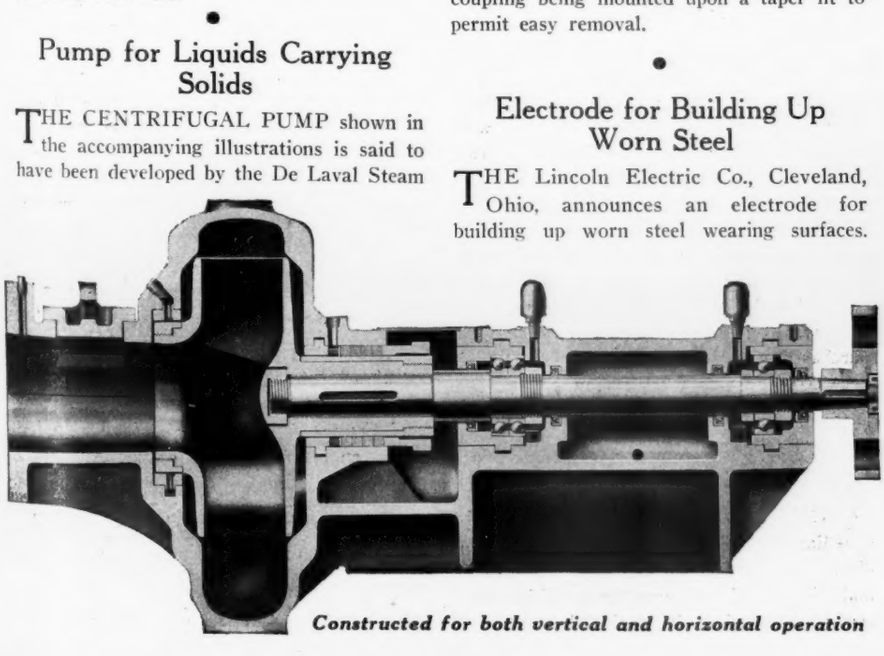
This machine is made in 2- and 4-cu. yd. capacities. It is said they will cut any depth from a thin layer to 1 ft. and will discharge in layers up to 18 in. in thickness. Other items in the Ateco line manufactured and sold by the Blaw-Knox Co. are bulldozers, scarifiers, tamping rollers and combinations of these machines.

•

Pump for Liquids Carrying Solids

THE CENTRIFUGAL PUMP shown in the accompanying illustrations is said to have been developed by the De Laval Steam Turbine Co., Trenton, N. J., for handling slurry, paper pulp and similar liquids and, according to the manufacturer, is clogless.

The casing is split in the plane of the shaft, with the discharge connection in the lower half, or casing proper. The casing cover can be lifted off without disturbing the discharge pipe connection and after partial unbolting of the suction pipe connection, it is said. A handhole is located on the cover half of the suction nozzle, to give quick access to the suction side of the impeller for inspection and cleaning. The suction nozzle is designed for a large size suction pipe.



Constructed for both vertical and horizontal operation

The pump casing proper has cast integral with it a pedestal or supporting foot, which is designed to be bolted directly to the bedplate of motor or engine driven units.

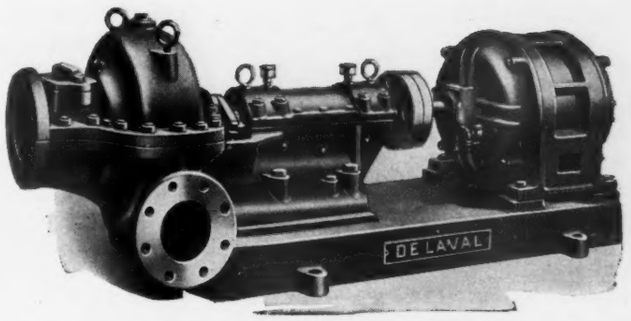
By suitably proportioning the impeller passages and volutes, it is claimed, the present pumps, which are operated at slow speed, have been made to compare favorably in efficiency with standard high speed clear water pumps.

Ball bearings are used. A flexible coupling which will not transmit end thrust and which allows for unavoidable misalignment is said to be used to connect the pump shaft to the driving shaft, the pump half of the coupling being mounted upon a taper fit to permit easy removal.

•

Electrode for Building Up Worn Steel

THE Lincoln Electric Co., Cleveland, Ohio, announces an electrode for building up worn steel wearing surfaces.



Designed for direct motor drive

This new electrode will be known as "Hardweld," and is said to contain about 1.00% carbon.

According to the manufacturer, it is designed for use in building up worn rails, locomotive tire flanges, car wheels, drill bits, tractor shoes, dipper teeth, and other wearing surfaces. A special coating used is said to eliminate wildness of the arc, characteristic of ordinary high carbon welding wire; to eliminate the boiling and resulting porosity in high carbon deposit; and to regulate the analysis of the deposit by controlling oxidation and variations of the arc length.

Tests made by depositing a bead of "Hardweld" on .60% carbon steel using a 3/16-in. electrode at 200 amp. are said to have resulted as follows:

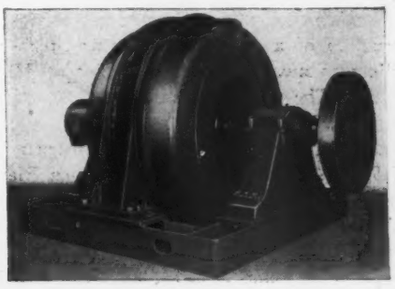
Cooled naturally	Rockwell C 33
Peened	Rockwell C 40
Quenched (from 1450 deg. F.)	Rockwell C 50

Hardweld is packed in 25-lb. tin containers and made in diameters of 5/32 in., 3/16 in. and ¼ in. with a length of 14 in.

•

Totally Enclosed Synchronous Motors for Anglo-Chilean Nitrate Co.

EIGHT totally-enclosed synchronous motors were recently purchased from the Westinghouse Electric and Manufacturing Co., Pittsburgh, Penn., by the Anglo-Chilean Nitrate Co. for installing in their plant at Pocotilla, Chile, South America.



Motors exclude corrosive dust

It is said these motors are practically airtight to exclude the fine corrosive dust of nitrate present in a crushing mill. They are rated at 250 hp., 250 volts, 550 amperes, 90% power factor, and are fan cooled.

Recent Prices Bid and Contracts Awarded

Phoenix, Ariz. The low bid of 55c. per cu. yd. on 9213 cu. yd. of subgrade stabilizer for the Globe-Safford highway, was made by the Martin Bros. Trucking Co., Duncan, Ariz. Its bid for the haul of 21,475 cu. yd.-mi. of subgrade stabilizer was 12½c.

Lockland, Ohio. Contract was awarded recently to Joseph Merkle for furnishing torpedo gravel at $1.25 per ton with 5c. per ton discount if paid by the 10th of the month.

Peru, Ind. Contract for gravel was awarded August 4 to the S. and L. Gravel Co., Marion, at 67c. per yd, for 1700 yd. Another contract at 55c. per cu. yd. for 7000 yd. has been let in Union township.

Ashland, Ky. The Moore Construction Co. of Ashland was awarded the contract for graveling of the Coal Branch road recently on the basis of 65c. per yd. for gravel and 5c. per lineal foot for subgrading. Seven miles are to be graveled 16 ft. wide and 6 in. deep.

Cherokee, Iowa. C. A. Emory of Coon Rapids received a contract for 32 mi. of new gravel and 27 mi. of maintenance gravel with a bid of $17,138.

Milwaukee, Wis. A new low bid of $1.30 a sq. yd. for concrete paving was received in bid submitted by the Bodemann Construction Co. recently. The previous low bid was $1.35. Bids for concrete curb were 49c. a running foot and $1.45 a sq. yd. for macadam paving.

Toledo, Iowa. A contract was signed recently with the LeGrande Limestone Co. for 1200 to 1500 yd. of limestone rock delivered on the streets at $1.70 per yd.

McPherson, Kan. At a meeting of the state highway commission recently, bids for sand were submitted on the basis of $1.70 a cu. yd. Other bids for furnishing material were by Reed-Wheelock for 2500 cu. yd. of gravel in Clay county at $1.60 per cu. yd., and the Blue Rapids Construction Co. for 3280 cu. yd. of gravel in Mitchell county at $2.00 per cu. yd.

Steubenville, Ohio. A contract for construction of a concrete road near Steubenville was awarded the low bidder at $47,955.98. The estimated cost of construction was $58,579.04.

Lincoln, Neb. Contract for construction of 9.3 mi. of concrete paving between Blair and Calhoun was awarded recently to the Western Asphalt Co. of Sioux City, Iowa, for $179,222.

Hamilton, Ohio. Contract for placing 1350 cu. yd. of gravel in Wayne township was awarded July 31 to A. B. Magaw at his bid of $1201.

Minerva, Ohio. The city council recently voted to purchase 200 tons of road resurfacing material from the Marble Cliff Quarries Co. of Columbus, for $4.23 a ton.

Dayton, Ohio. Eight dealers bidding on cement submitted the same figures, it was disclosed when their bids were opened recently. On six cars of cement each dealer bid $1.50 a bbl., with 10% discount.

Chicago, Ill. Ruling retail prices in the Chicago market August 8 were as follows: Portland cement in paper, per bbl., $2.10; lake sand, carloads, rail delivery, $1.70 per yd., by truck $2.00 per yd.; torpedo sand, carloads, rail delivery, $1.50 per yd., by truck, $2.00 per yd.; gravel, carloads, rail delivery, $1.50 per yd., by truck, $2.00 per yd.; crushed limestone, carloads, rail delivery, $1.50 per yd., by truck, $2.00 per yd. Crushed or roofing gravel per yd. delivered, $2.20; No. 1 torpedo, $2.25 per yd., and No. 2 torpedo, $2.00 per yd.

Discover Western Kansas Gravel Deposit

ANOTHER STRIKE, it is believed, has been made in Ellis county, Kan. This time it is "high test" limestone gravel that may prove to be just what the Kansas Highway Commission is looking for to use on its road in western Kansas.

Engineers in inspectng the route of highway No. 1 recently came upon limestone gravel that aroused their curiosity. Rough measurements indicated an extensive supply on one of the ridges of the ranch, so it was decided to make tests to determine whether the gravel was of the quality desired for road work.

After a number of preliminary tests the engineers believe they have discovered limestone gravel of a quality they did not know existed in that part of the country, and the quantity of this gravel apparently is sufficient for all road work improvement where this kind of surfacing material is needed in that part of Kansas.—*Hays City* (Kan.) *News.*

Reject California Crushed Rock Bids

EXERCISING THEIR RIGHT to reject all bids, the Butte county, Calif., board of supervisors recently rejected three estimates for supplying the county with crushed rock during the coming fiscal year, and instructed the county engineer to purchase the rock on the open market.

The bids, submitted by three companies, were considered by the board to be excessive, following a report to that effect submitted by Engineer J. A. Bumgarner.

It was estimated that the rock can be purchased on the open market for $20,000 or $25,000, nearly $10,000, lower than the bids.—*Oroville* (Calif.) *Mercury Register.*

Elected Director

ANNOUNCEMENT is made that William R. Daley of Otis and Co. has been elected a director of Bessemer Limestone and Cement Co., Youngstown, Ohio, succeeding Richard Inglis, resigned.

Win Concrete as Alternate in Indiana Road Specifications

ANNOUNCEMENT was made July 29 by officials of the Indiana highway commission that the new bids to be received on 128 mi. of highway paving will embrace five types of paving, supplanting the three types that were involved in a recent injunction issued by the Marion county circuit court.

The new materials specified by the commission's order for the so-called high-type roads will be brick, concrete, rock asphalt, bituminous concrete and asphaltic macadam.

On the so-called low-type roads the new materials that will be advertised for will be brick, concrete, bituminous retread, bituminous-coated aggregate and either puddled macadam or rock asphalt.

Some time ago the commission in advertising for the construction of the 128 mi. of road over the state asked for bids on three types of "black top" material. An injunction suit was brought and the circuit court restrained the commission from limiting its materals to these three, holding them to be similar in content.

The commission met July 28 to discuss the decree and alter its specifications to meet the requirements of the decision. Members of the commission said later that in some instances the brick and concrete paving would be able to compete with the "black top" group of materials on the high-type roads, but doubted that this would be true on the low-type jobs.—*Indianapolis* (Ind.) *News.*

Seek Reduction on Crushed Stone Prices

THE MATERIALS COMMITTEE of the South Carolina state highway commission met July 28 with representatives of crushed stone companies and discussed the possibility of a reduction of prices at the plants.

No definite action was taken and committee members indicated that none would be until the highway commission meets in August. Representatives of sand pit operators had been invited to attend but did not appear, it was announced.—*Charleston* (S. C.) *News and Courier.*

Concrete Pavement Awards

CONCRETE PAVEMENT yardage awarded in the United States during the month of July, divided according to roads, streets, and alleys, as reported by the Portland Cement Association, and the totals for the seven months' period ending August 1, 1931, are:

	Yardage awarded— During July, 1931	August 1, 1931
Roads	9,309,088	89,977,333
Streets	3,061,583	13,887,378
Alleys	98,900	512,890
Total	12,469,571	104,377,601

News of All the Industry

Incorporations

Wallington Sand Co., Sodus, N. Y., $50,000. H. O. Button.

Charlotte Marble and Granite Co., Charlotte, N. C., 400 shares no-par value. Frank and McCamy Sims and F. Grainger Pierce.

Builders Sand and Gravel Corp., Brooklyn, N. Y., 200 shares common. W. Godnick, 16 Court St., Brooklyn.

T. W. Lanigan, New York City, 300 shares common. J. Kelly, 2 Lafayette St., New York City. To deal in cement and lumber.

Dunlop Sand and Gravel Corp., Petersburg, Va., has filed application for revival of charter. Maximum capital $75,000. John M. Dunlop, president.

Chieftan Marble and Lime Co., Enterprise, Ore., $100,000. F. G. Henning, George P. Eheney and L. E. Jordan.

Rusk Manufacturing Co., Overton, Tex., $100,000. H. H. Coffield and J. H. Edwards. Minerals.

Arundel-Brooks Concrete Corp., Baltimore, Md., 5,000 shares no-par value. Joseph J. Heck, Walter B. Brooks, Jr., and Richard A. Froehlinger.

External Concrete Corp., Rochester, N. Y., $10,000 preferred and 150 shares common. H. L. Abt, Buffalo.

Apfield Ristau Concrete Products Co., 712 E. Empire St., Bloomington, Ill., $27,000. Albert F. and Mrs. Arline J. Ristau, Joseph and Mrs. Vera Apfield. To deal in concrete products.

William Gall Crusher Co., Ableman, Wis., 250 shares at $100 each. Wm. Gall, Sr., G. R. Volz and Wm. Gall, Jr. To engage in crushing rock, quarrying and road building.

Keil Stone and Gravel Corp., Hudson, N. Y., $25,000. Gotlieb Keil, 50 Fairview Ave., Hudson, and John Keil and David Keil of the Town of Stockport.

G. M. G. Mica Co., Boston, Mass., $10,000, 100 shares common at $100 each. Arthur Pratt, president; Flora N. Glover, treasurer, 159 West Seldon St., Boston, and Irene M. King. To deal in mica, mining ores, etc.

State Center Mining Co., Asheboro, N. C., 1000 shares no-par value. J. D. Ross, Ida M. Ross and R. G. Ferree of Asheboro and Ora Grace Overton of Washington, D. C. To sell and deal in gravel, building stone, rock, sand, clay, etc.

Quarries

Columbia Marble Co., Knoxville, Tenn., is developing a quarry in Cherokee county, N. C.

Consumers' Rock and Gravel Co. will erect an asphaltic concrete plant at Van Nuys, Calif.

San Leandro Rock Co., San Leandro, Calif., has moved its offices to the offices of the Ry-Lock Co. to centralize both businesses, it is said.

Eldorado, Kan. The county has purchased a new crusher to reduce gravel too large for road work.

Hopewell Center quarry, near Tiffin, Ohio, has installed a new washer and is now furnishing washed stone on its contracts.

G. A. Liebenstein and **E. G. Stengel** have purchased the Swanson stock in the Dakota Granite Works.

Bethany quarry, near Bethany, Mo., which has been running since March 16 has shut down, as present contracts have been filled and no large contracts are in immediate prospect.

Huddleston quarry near DeWitt, Mo., being operated by the U. S. War Department is working 250 men in two shifts. Work should be completed soon.

Logansport, Ind. The recently purchased stone quarry of the highway department has been moved from the Bowyer gravel pit to the Bruce farm where it is to be placed in operation.

H. William Miller, Burlington, Ia., has engaged with a material firm to manage a rock, gravel and fertilizer business, the plant of which will be located at the old stone quarry near Gladstone, Ill.

Ohio **Crushed Stone Association**, in a recent issue of "Better Highways," official organ of the association, discusses low-cost city pavements as developed and used in Sandusky, Ohio.

Arthur F. McConville, Ogdensburg, N. Y., recently placed in operation the new crushing plant installed in his quarry. It increases the capacity 500 tons daily.

East Cleveland, Ohio. The tall, wooden stone crusher building on the Hayden Ave. side of the Cleveland Railway Co. property will be torn down soon, according to officials of the company.

Joseph Henritzi, Spokane, Wash., recently leased the rights for development of stone deposits near Tenino. The contract specifies work must be under way in six months.

Toledo, Ohio. Mayor Jackson, in his campaign for re-election as mayor cited as one of his accomplishments while in office "the establishment of a stone quarry so that the city gets its stone at cost."

Reinbeck, Iowa. Claims against Miller and Smith, operators of the limestone quarry on the Verly farm near Fifteen Mile Grove were settled recently on the basis of two-thirds of their value. Most of the claims were for labor and truck hire.

A. W. Hammond, Raymond, Wash., was to open his quarry about August 15. Work on the project has been going on for about a year and blasting will start soon. He states the rock passes the state test. The plant will have daily capacity of about 60 yd.

Lewistown, Ida. The barge line recently put in operation on the Columbia river should make limestone deposits along the river economically available for industries using this product in their manufacturing processes located along the river, according to local opinion.

Wapakoneta, Ohio. Stone to be used this summer in county road improvement will be taken from Auglaize county stone quarries and gravel pits. It is the policy of the surveyor and commissioners to purchase stone from local plants whenever the price is equal to or within ten cents per ton of outside quarry prices.

Lawrence, Mass. Alderman McCarthy recently decided to accept deliveries of stone from the H. E. Fletcher Co. of West Chelmsford under its contract with the city. The alderman claimed the stone was not fitted for road building purposes but the mayor would not support him in the claim. The alderman states he will not be responsible for the quality of the streets to be built. This controversy has waged for several weeks.

Sand and Gravel

Hoagland-Hardy Sand Co., Evansville, Ind., has opened a new sand pit at Camden, Tenn.

Lewes Sand Co., Wilmington, Del., recently received publicity in a local paper in the form of a news story describing its business.

H. K. Stewart, Texarkana, Ark., has purchased the building material, plant and equipment of Meriweather Sand and Gravel Co.

Oneonta, N. Y. The railroad company is reported to be behind the sand and gravel plant being erected at South Edmeston.

Northeast Missouri Sand and Gravel Co., New London, Mo., closed recently. It is not known when it may reopen.

Meneely Construction Co. moved its gravel plant to Thornhope, Ind., where material will be produced for the rest of its road contract.

Carpentersville, Ill. The fire department was called recently to extinguish a fire in the gravel pit near here.

Henderson Sand and Gravel Co., Henderson, Ky., recently filed suit in Superior Court against City Judge Charles J. Eichel, Jr., of Evansville, Ind., charging breach of contract.

Adrian, Mich. Harold Kiger was caught in a cave-in of the gravel pit from which he was hauling gravel while working alone. His leg was broken.

R. H. Eastwood Sand and Gravel Works, Grayville, Ill., is preparing a new site for removal of its upper plant to a new location. Actual removal of machinery and other equipment to be installed, together with new equipment, is expected soon.

Eau Claire Sand and Gravel Co., Eau Claire, Wis., is starting to operate on a large scale, it is reported. A pit has been bought at Saugen, and the old Soo line pit at Bruce has been leased by the company.

Rapid City, S. D. Indications are that there is a sufficient supply of gravel to surface and maintain trunk highways in the west river district, according to E. P. Rothrock, state geologist, who is conducting a survey in the west river section.

A. I. Cram Contracting Co., Burwell, Nebr., has opened a gravel pit on the Lawless farm near Ericson, Nebr., where it will get gravel to supply the requirements on local street improvement contracts.

Elkhart, Kan. A heavy layer of caliche deposited on streets by the highway department recently has caused so much dust that a crew is removing it from the streets, following complaints of residents. Gravel with a minimum amount of gypsum will be used on future work.

Liberty Corp., Philadelphia, Penn., an aggregate producer and distributor which also operates a central mixed concrete plant, was recently described and a picture of its dredge and some of its steel barges shown in a news story in the Philadelphia Record.

J. W. Brannan Sand and Gravel Co., Denver, Colo., elected the following officers at the reorganization which followed the death of J. W. Brannan. F. P. Spratlin, president and treasurer; L. S. Brannan, vice president and secretary; and Mrs. J. W. Brannan, second vice president. Mr. Brannon died last fall.

Cement

Dayton, Ohio. In every instance in which the city has purchased cement on bids this year all bids are said to have been the same.

Hawkeye Portland Cement Co., Des Moines, Ia., has filed suit against A. F. Johnson, bridge contractor, for money due it for cement used in construction work.

Concord, Calif. Legal aspects of the fight to eliminate dust from the cement plant at Cowell were explained to the farmers at a recent meeting at the Concord Farm Bureau clubhouse.

Allentown Portland Cement Co., Catasauqua, Penn., had a fire in the bag house of its plant at Evansville, August 5. Only a slight damage was suffered. The origin of the fire was unknown.

Pittsburgh Plate Glass Co., Columbia Cement division, plant employes held their annual picnic recently. A program of athletic stunts, a ball game, band concert and other entertainment was enjoyed.

Wabash Portland Cement Co., is expected to close its plant at Stroh, Ind., and carry on all manufacturing operations at the Osborn, Ohio, plant until business conditions justify its reopening.

Valley Forge Cement Co., Catasauqua, Penn., has suspended operation of its plant for the month of August. Shipments will be made from stock. The plant has been in operation since it was opened in 1927, it is reported.

Bessemer Limestone and Cement Co., Bessemer, Penn., has recalled 100 men to work recently. Further recalling of the company's employes is said to be likely soon if demand for its products is maintained.

Three Forks Portland Cement Co., Denver, Colo., is closing its Hanover cement plant until its present stock now on hand is reduced. J. C. Capper, superintendent, reports the plaster mill and gypsum mines will continue as usual.

Lehigh Portland Cement Co. plant at New Castle, Penn., was recently damaged by fire in the packing department. The blaze was confined to the one unit. It is reported the Metaline Falls, Wash., plant will not shut down this summer, as has been customary.

Northwestern States Portland Cement Co., Mason City, Ia., sponsored the annual golf tournament of its dealers at the Mason City country club. A banquet was served after the play ended during which entertainment was enjoyed. A number of prizes were awarded.

Spokane, Wash. Bankruptcy sale of R. K. Neill's interest in the International Portland Cement Co. to W. F. Powell of Ottawa, Canada, was recently blocked on a technicality. It is understood sale of this stock will virtually carry control of the company.

New Village, N. J. It was recently announced, following a visit of Henry Ford at the plant of the Edison Portland Cement Co., that he has in mind securing, for preservation in his museum, some of the machinery which Thomas A. Edison installed when the plant was erected.

Kosmos Portland Cement Co., Inc., Kosmosdale,

Ky., is issuing a monthly news-magazine of the construction industry in its trade territory. The August issue is 8-pages printed on enameled stock and is profusely illustrated. Interesting engineering projects are described, there are stories of dealers activities and pertinent news of interest to contractors, and material dealers and producers.

Cement Products

Gravel Products Corp., Buffalo, N. Y., has installed ready mixed concrete equipment and is now making deliveries.

Arundel-Brooks Concrete Co., Baltimore, Md., has filed plans for new ready mixed concrete plant to cost about $50,000. W. B. Brooks, Jr., is president. Contract has been awarded.

Watertown Building Supply Co. will locate in Woburn, Mass., it has been announced by the New Boston Gravel Co. It manufactures soil pipe, brick and other cement products.

Ohio Builders and Milling Co., Canton, Ohio, has added trucks for delivering truck mixed concrete. It is reported a total of $50,000 will be spent on such equipment.

Central Concrete Mixing Corp., Brooklyn, N. Y., and its organization was recently described in a story that appeared in Motor Transport.

Superior Ready Mixed Concrete Co., Cincinnati, Ohio, has received some excellent publicity of its service in a news story that recently appeared in Cincinnati papers telling of its operation.

Lime

Memphis Lime and Cement Co., Memphis, Tenn., was recently purchased by John A. Denie's Sons Co. It is said both organizations will remain intact.

St. Joe Lime and Stone Co., St. Joe, Ark., lost its plant by fire recently. It is reported to be largely insured.

Miscellaneous Rock Products

Birmingham Slag Co., Leeds, Ala., has completed plans for a one-story office building.

Dixie Glass Bottle Manufacturing Co., Jackson, Miss., has awarded contract for its new plant and work has begun.

Pacific Hardstone Brick Co., Los Angeles, Calif., will erect a new brick plant to cost over $70,000, with machinery.

Armour Fertilizer Works at Columbia, Tenn., has purchased the mining lease of the Ridley Phosphate Co. for deposits along Mt. Pleasant pike and has begun operations on the property. J. A. Chapman is the local manager.

Tennessee Quartzite Producers, Inc., operating five quartzite quarries in the vicinity of Crab Orchard and Crossville, Tenn., has moved its offices to Knoxville. E. Rhode is president and sales manager, A. J. McClary secretary-treasurer and Herman A. Schubert vice-president and general manager.

Personals

Joseph J. Baxter has recently joined Superior Portland Cement, Inc., as assistant purchasing agent at the Concrete, Wash., plant.

H. A. Wittle recently gave an interesting talk on concrete to the St. Johnsbury, Vt., Kiwanis club at its regular meeting.

Ralph P. White, superintendent of the Petrie Lime Co., at Blubber Bay, B. C., was recently married to Katherine Florey Napton.

Frank M. Ross, managing director of Consolidated Oka Sand and Gravel Co., Ltd., recently underwent an operation at the Montreal, Canada, General Hospital.

H. E. Jordan has been appointed advertising manager of the Universal Gypsum and Lime Co., Chicago, Ill. He was formerly advertising manager of the Johnson Motor Co.

George J. Nicholson, vice president of the Inland Lime and Stone Co., Manistique, Mich., recently returned from a ten weeks vacation trip to Europe.

W. A. C. Smith and **S. D. Knight** of the Cleveland Quarries are reported to have discovered data showing the stone industry to be older, probably, than any thing except agriculture in this locality. Millstones were said to be the first product.

Jeanette Foster Kennedy Butchart, wife of the president of the Oregon Portland Cement Co., Portland, Ore., and creator of the famous Butchart gardens at Victoria, B. C., was recently named Victoria's best citizen in the yearly award bestowed by the Victoria Post of Native Sons of British Columbia.

Salt Lake City, Utah. Recent visitors at the Utah Experiment Station were Clyde E. Williams, assistant director of the Battelle Memorial Institute, Columbus, Ohio; H. A. Buehler, Missouri state geologist; and P. B. Bucky, assistant professor of mining at Columbia University. These visitors were consulting with Dr. Lyon, director of the station on problems of the mining and metallurgical field.

H. H. Morgan

H. H. Morgan, designer of many conveyor installations in the automobile industry, is now in Detroit as special engineering representative for the Weller Manufacturing Co. of Chicago, Ill., and is occupying offices at 10228 Woodward Avenue. Previously Mr. Morgan has been assistant chief engineer in charge of draughting for the Palmer-Bee Co. and prior to that was a member of the engineering staff of The Webster Manufacturing Co. (now affiliated with the Weller Co.).

Hugh M. Wolflin of Los Angeles, Calif., has been appointed supervising engineer of the Intermountain Experiment Station of the United States Bureau of Mines, Department of Commerce, Salt Lake City, Utah, Scott Turner, director of the bureau has announced. Mr. Wolflin will immediately assume his duties, and it is believed that his appointment is logically the first step in carrying out the Bureau's plans for increasing the general usefulness of the Intermountain Station. Mr. Wolflin holds degrees from the University of Arizona and Columbia University, having specialized in metal-mining methods at the first-named institution.

Manufacturers

Walsh Fire Clay Products Co. of St. Louis, Mo., Buckeye Clay Products Co. of North Toledo, Ohio, and Laclede-Christy Clay Products Co. of St. Louis have recently consolidated.

Besser Manufacturing Co., Alpena, Mich., has secured a substantial financial interest in Consolidated Concrete Machinery Corp. of Adrian. It is said there will be no change in operations at present.

Cleveland Tractor Co., Cleveland, Ohio, has recently received an order for 125 crawler type tractors from the Pennsylvania state highway department. This is a step in Governor Pinchot's program to "get the farmer out of the mud."

Newark Wire Cloth Co., Newark, N. J., announces it has appointed The Pacific Metals Co., Ltd., as West Coast representatives. This concern will carry a limited stock both in Los Angeles and San Francisco.

Stedman's Foundry and Machine Works, Aurora, Ind., announce appointment of the following representatives: Goggin and Mills, Chicago, Ill.; Louis Mardaga, Pittsburgh, Penn.; J. Y. Riffe, Charleston, W. Va.; S. D. Galloway, Kansas City, Mo.; and Brown, Fraser and Co., Ltd., Vancouver, B. C.

Interstate Equipment Corp., New York, N. Y., announces that B and B Aerial Tramways and Automatic Aerial Tramways are now consolidated and will be handled by its tramway department. The engineering office for both tramway departments will be located at 25 Church Street, New York.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., has received an order from the Mercury Manufacturing Co. for ten control equipments for Industrial Storage Battery trucks. These control equipments consist of a master switch and a panel on which are mounted individual contactors for making and breaking the circuit from the battery to the motors. The small master switch is used to operate the control circuit to the contactors.

Deister Machine Co. of Fort Wayne, Ind., has acquired from time to time, since its incorporation in 1912, the exclusive right to the manufacture and sale of all Deister equipment and improvements under Deister patents, for which applications were made subsequent to January 1, 1912, and also other patents, pertaining to ore concentrating tables, coal washing tables, coal washers, self-oiling headmotions for same, vibrating screens, classifiers, etc. This announcement is made, it is said, due to the apparent lack of knowledge in some sections of the mining world, relative to the scope of its activities.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention Rock Products.

Pressure Gage Shock Absorber. Bulletin 2 describes operation of the Meriam pulsation absorber. MERIAM CO., Cleveland, Ohio.

Welded Gear Blanks. Folder illustrates and describes types of gears produced by arc-welding rolled steel. LUKENWELD, INC., Coatesville, Penn.

V-Belt Drives. Four-page bulletin illustrates several applications of "Texrope" drives, and briefly describes them. ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

Fuel Pulverizer. Bulletin 12 is an 8-page illustrated bulletin that describes applications of the Whiting Table-Roller pulverizer. WHITING CORP., Harvey, Ill.

Belt Dressing. Booklet tells causes and suggests a method of treatment for slipping belts. This booklet is illustrated. GRIPWELL MANUFACTURING CO., New York, N. Y.

Spiral Welded Pipe. Engineering bulletin has been published to assist engineers in the design of pipe lines for pressure. AMERICAN ROLLING MILL CO., Middletown, Ohio.

Air Heaters. Illustrated bulletin describes air heater applications, and the "Thermix" air heater construction. Features of equipment are discussed. PRAT-DANIEL CORP., New York, N. Y.

Crane Service. Rotogravure bulletin illustrates and gives brief description of work where crane equipment was supplied. CRANE SERVICE ASSOCIATION, Lorain, Ohio.

Potentiometer Pyrometer. Folder shows in tabloid form principal features of the new Brown potentiometer Pyrometer. BROWN INSTRUMENT CO., Philadelphia, Penn.

Crawler Tracks. Catalog describes use and application of "Roadlayer" tracks. LA PLANT-CHOATE MANUFACTURING CO., Cedar Rapids, Ia.

Portable Bulk Cement Unloading and Conveying Systems. Bulletin B-4 contains many illustrations of Fuller-Kinyon portable systems with detailed drawings of the equipment and typical installations. FULLER CO., Catasauqua, Penn.

Wire Rope. Yellow Strand is the title of monthly bulletin telling of different work and jobs where "Yellow Strand" wire rope is in use. BRODERICK AND BASCOM ROPE CO., St. Louis, Mo.

Explosives. July issue of the Du Pont Explosives Service bulletin has an article on low density ammonia and semi-gelatin dynamites. E. I. DU PONT DE NEMOURS AND CO., INC., Wilmington, Del.

Convertible Shovel. Bulletin describes the 1-yd. 32-B gasoline, diesel, electric convertible shovel, dragline, clamshell, crane. Large illustrations present clearly a complete story of this new machine. BUCYRUS-ERIE CO., South Milwaukee, Wis.

Vibrating Screen. "The Jigger" is the title of folder describing and illustrating features of an adjustable vibrating screen. A list of users is shown. PRODUCTIVE EQUIPMENT CORP., Chicago, Ill.

Bar Screen. Folder 1287 describes the Link-Belt mechanically cleaned bar screen designed to continuously remove refuse and solids from fluids. The mechanism is illustrated and described in detail. LINK-BELT CO., Chicago, Ill.

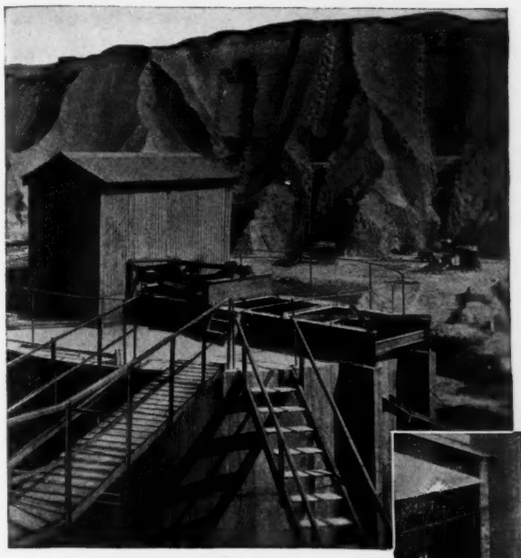
Laboratory Furnace. Publication describes new quick-melting compact and high-temperature furnace for melting small samples of ceramic materials or non-ferrous metals. BABCOCK AND WILCOX CO., New York, N. Y.

Lock Nuts. Illustrated publication describes principle of the General automatic lock nut that is claimed to remain secure under the most severe operating conditions. GENERAL AUTOMATIC LOCK NUT CORP., New York, N. Y.

Centrifugal Pumps. Specification sheet W-321-S1 describes type D "Monobloc" centrifugal pumps and gives detailed description of this unit. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

Dust Filters. Bulletin S-80 describes recent developments and improvements in the Sly dust filter. A short history of the development is given which is followed by complete details of construction and operation. Drawings and photographs illustrate features and installations. W. W. SLY MANUFACTURING CO., Cleveland, Ohio.

Ready Mixed Concrete Equipment. Catalog 1302 illustrates and describes representative units of Blaw-Knox Batcher plants, steel storage bins, measuring equipment, and other appurtenances and equipment for the storage, measuring and handling of bulk materials and for the production and hauling of concrete. BLAW-KNOX CO., Pittsburgh, Penn.



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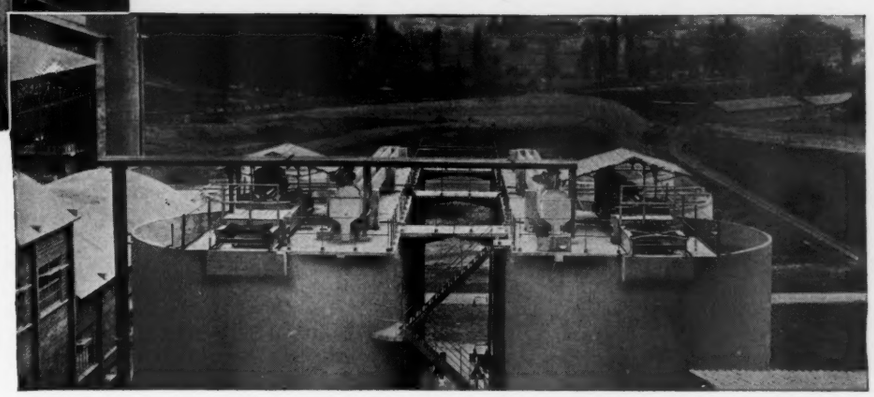

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Such worth-while savings are of interest to most cement mills, particularly at the present time. At this particular plant the Dorr Mixer installation requires about 11 h. p. Mixing is complete in 4 hours.

With other type mixers power requirements ran about 25 h. p. and 8 hours were required for complete mixing.

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